



NEWSBULLETIN

OF THE AUSTRALASIAN CERAMIC SOCIETY

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COVER PHOTO

Example of a controlled crystalline surface,
of a pot 300 mm high x 290 mm wide.

*Peter Wilson,
Charles Sturt University
Bathurst, Australia*

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A MESSAGE FROM THE PRESIDENT

Welcome to your Ceramics Society news bulletin.

As my first message to members as president, I would first like to acknowledge and thank Cathy Inlgis for her effective and enthusiastic chairmanship of the society for the last 2 years. Leading scientific and professional societies is increasingly difficult, as members have such conflicting constraints that the time to be involved is more difficult to find than in the past. I look forward to your support, and suggestions through the state branches, for any way you can be involved, or suggestions for improvement.

Cathy has agreed to continue as the Editor of the News Bulletin, and has coordinated with Tim Palmer who will look to a new impetus to the news bulletin as Associate Editor. We are continually questioning and looking to ways we can make the news bulletin relevant, supportive of members, and on time, so we believe Cathy and Tim will make a difference. They look to support from contributing editors from each branch, and of course from you the members.

Austceram 2002 in Perth was very successful, and reinforced to me that the Society is still a "voluntary

association of people meeting for common professional " discussion, but there is more, the society is social i.e. there is "the companionship with ones fellows', "enjoying friendly or intimate intercourse". (Perhaps Websters Dictionary has gone a little further in its description than I can report factually) But it certainly was an event for people to enjoy each others company, as well as the technical interaction content. Thankyou again to the organising team.

I would like to especially extend a warm welcome to new members of the Society; this society is a window to the international world of ceramics related activities, as well as the way to feel part of a community in your own home state.

Finally , all the best for the holiday, and festive season, whether it be Deepavali, Hari Raya Pusua, Christmas, Thanksgiving, Id-al-Fitr, New Years Day (for all calendars),.... Our membership is so diverse I am sure I cannot recognise all.

*Viv Lawrie
Federal President
November 2002*

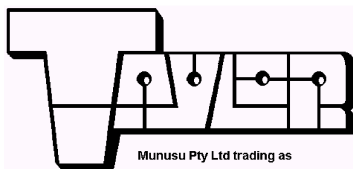
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NEW SOUTH WALES BRANCH NEWS

ACI Plant Visit

A recent tour of ACI Packaging's glass bottle manufacturing plant in Sydney found a new appreciation for what goes into the bottles that many of us take for granted. The production process is truly amazing. Starting with furnaces not much larger than a backyard swimming pool, a handful of furnaces this size produce enough glass to supply nearly 3.5 million bottles per day. The bottles produced in this particular plant supply three main areas: food; wine and spirits; and beer. It may come as no surprise that of the 3.5 million bottles produced daily, the majority (40-50%) go to the beer breweries and such is their demand, little if any stock is held by the manufacturer.

Small gobs of molten glass fly down chutes from the furnace to the forming machine where they were then pressed and blown into bottles. The whole transformation from gob to bottle taking only a matter of seconds. With each production line producing 8 to 48 bottles at a time, you can imagine how frantic the whole process is, as well as getting an idea of how

much beer Australian's consume! Bearing in mind that this plant supplies only the local breweries and is one of 5 nationwide that perform a similar task.

What was also amazing was the quality control that takes place, with bottles being tested for thickness, roundness and pressure holding abilities. And all at a rate that was simply astounding.

Christmas Celebrations

The Christmas function took place at a small Italian eatery in Gladesville, Café Vespa. Following our visit to ACI during the year and our new understanding of the process of manufacturing glass bottles, we did our best to appreciate the glass bottles our cold beers and red wine came in. Instead we probably appreciated the good food, good company moreand I suppose the red wine as well.

Wishing everyone a happy and safe Christmas and all the best for the New Year.

Cathy Inglis
NSW Branch President



CORPORATE MEMBERSHIP

Is your company interested in becoming a corporate membership?

Corporate Members may nominate two representatives of their organisation as members and receive free advertising space in a Society publication on one occasion.

A membership form is available on the *Australasian Ceramic Society* website at the following address:

<http://www.ozemail.com.au/~ausceramsoc>



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VICTORIAN BRANCH NEWS

Two outstanding British speakers gave presentations on the 27th March 2002 relating to Systems Engineering as it relates to assemblies involving ceramic components. Prof Chris Brookes (University of Hull) cited several case studies concerning the development of Mg-PSZ hydraulic piston pumps for oil exploration and other applications. Dr J Knezevic (Founder and Director of the MIRCE Academy, UK) spoke on the value of using science, rather than statistics, to predict failure of any individual component so that a system's service life can be extended. Afterwards, dinner was enjoyed by most of the attendees at Café Hobson, in Sandringham.

On Wednesday 24th April, Professor Dennis Else, Chairman of the National Occupational Health & Safety Commission gave an informative talk entitled "The NOHSC National Improvement Strategy and Safe Design". The meeting was well attended with the speaker receiving numerous in-depth questions from the audience.

The branch AGM was held on Thursday 23rd May at the ever-popular Prince Albert Hotel in Richmond. After presenting his report, retiring President Steven Zsembury welcomed the new incoming committee following their successful election by the branch members. The new committee was as follows:

<i>Office Bearers:</i>	<i>Committee Members:</i>
President: Nigel Stone	Richard Bowman
Secretary: Martin Stuart	Dr. Yi Bing Cheng
Treasurer: Dr. Jeff Sellar	John Cullen
Ex Officio: Stephen Zsembury	Mark Curtis
	Mark Hulme
	Gerald Ng

A successful joint meeting with the Institute of Refractories Engineers and the Australian Foundry Institute was held at the Redback Microbrewery North Melbourne on the 12th June when a presentation was given by Mr. Manavin

Suvarnadesa from Siam Refractory Industry, Thailand. The topic of his talk was "Ladle refractories for steel and iron applications" and highlighted the performance benefits of magnesia-spinel materials.

Following the society AGM, the opportunity was taken to hold a social gathering on July 17 at the Monash University Club. Despite the small number of members who attended, the evening was most enjoyable.

A very successful and well-attended evening was held on the 29th August at a new venue (Gateway on Monash Hotel) where Gerald Ng (St. Gobain Industrial Ceramics) gave a very informative talk entitled "Developments in Wear Resistant Ceramics". The extensive activities of the international St. Gobain group of companies was described as well as more local applications involving a number of wear resistant ceramics. As a reward for his fine efforts, Gerald was approached with a view of joining the Branch committee, which he gladly accepted.

Local society member Dr. Richard Hannink was awarded the prestigious biennial ACS award during the Austceram 2002 conference in Perth held early October. On behalf of the local committee, I would like to congratulate Richard in winning this award; he is a very worthy recipient.

Once again a successful branch golf day was held on Friday 1st November at the Ivanhoe Golf Club to compete for the GFC Kilns International perpetual trophy. For the second year in a row, the event was won by Gus Stegstra (Darley Refractories) in a count back from Ken Featherstone (Unifrax).

Future Meetings

February 2003: Provisional works visit to Alcoa's aluminium smelter at Point Henry, Geelong.

March 2003: Provisional talk on geopolymers by Dr. Kwesi Sagoe-Crentsil, CSIRO Manufacturing & Infrastructure Technology.

May 2003: State branch AGM

*Nigel Stone
Victorian Branch President*

WESTERN AUSTRALIAN BRANCH NEWS

Austceram 2002, organised by the Western Australian Branch of the Australasian Ceramic Society, and held at the East Perth campus of Central TAFE on September 30 – October 3, proved to be a great success. Austceram 2002 was a novel conference in that the Organising Committee decided to incorporate the Industrial Minerals Centre Australia (IMCA) into the conference, while the Institute of Refractory Engineers (IRE) held their quarterly meeting as part of the conference.

There were 198 registrants from 18 countries including Australia. Delegates came from as far and wide as Canada, China, Germany, Japan, Korea, Malaysia, Portugal, Singapore, Sweden, United Kingdom and the United States of America. The number of delegates was sufficient to make the conference a financial success to the extent of making a modest profit for our Federal body.

The Technical Program attracted some 100 oral presentations and 60 poster presentations. All papers were refereed prior to being incorporated into the Conference Proceedings. The presentations of the four Keynote Speakers, Dr Lawn, Professor Niihara, Dr Chotimongkul and Professor Karmis were well received by the delegates.

The Exhibition attracted 13 companies in what was a somewhat difficult period to attract companies. In the final analysis, the numbers of Exhibition booths

and Posters were such that they fitted rather “cosily” at the eastern end of the main foyer.

The success of the conference may also be attributed to the excellent Secretariat, Strahan Consultants. Pat Strahan and her team’s attention to detail ensured that the conference and its planning ran so smoothly. Delegates thoroughly enjoyed the Cocktail Party at AQWA, Hillarys, the Dinner at Frasers Restaurant, Kings Park and the social programs organised on the Wednesday afternoon. Some 24 people went on the half-day tour to Millennium Performance Chemicals, Australian Fused Materials and Rojan Advanced Ceramics, while a small group went on the full-day tour of Iluka Resources at Capel. We are not aware of a single complaint made during those 5 days!

The Society is also indebted to Central TAFE and, in particular, to the efforts of Ms Anne Blythman for providing a superb venue and the back-up facilities needed to ensure a successful conference.

The success of a conference is ultimately a function of the Organising Committee, and the hard work of your WA Branch Committee members ensured this success. We may be a small Branch membership in Western Australia, but all WA Branch members can feel proud of the achievements of Austceram 2002.

*Report on Austceram 2002
David Phillips.
Secretary, Austceram 2002
WA Branch Secretary*



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To arrange a visit to ANSTO to discuss your problems or ideas, or for further information please contact:

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AUSTCERAM 2002 IN PICTURES

Here are few photographs taken at Austceram 2002, more photographs are located at www.austceram.com.



Left: Australasian Ceramic Society President, Viv Lawrie, welcomes conference participants to Austceram 2002.



Above: The Technical Program for Austceram 2002 Conference incorporated approximately 100 oral presentations. Dr. Brian Lawn was one invited keynote speaker. Dr. Lawn is from the National Institute of Standards and Technology, USA and is pictured here presenting a paper on *Contact Damage Modes in Layer Structures for Biomedical Applications*.

Right: Austceram 2002 Conference participants enjoy a relaxing coffee break.





Left: Austceram 2002 attracted close to 60 poster presentations.

Right: The Exhibition attracted 13 companies. Advanced Nano Technologies were one company that provided an Exhibition. Advanced Nano Technologies has developed a new low cost process for the manufacture and supply of a wide range of ultra fine and nanoscale powders.

<http://www.ant-pwders.com>



Left: Rojan Advanced Ceramics Pty Ltd was another company that provided a Trade Exhibition stall for Austceram 2002. Rojan is committed to providing superior products and technology in the area of engineering ceramics and related advanced materials.

<http://www.rojan.com.au>

FACTORS AFFECTING CRYSTAL GROWTH IN HIGH-TEMPERATURE CERAMIC GLAZES

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INTRODUCTION

Crystalline glazes were first developed commercially for the ceramic industry in France in the mid-nineteenth century. They became popular in Europe and America in the 1880s, and have been in use sporadically since then. With the developments in kiln technology over the past twenty years, there has been a renewed interest in them, especially within the studio pottery movement in the western world.

This paper describes some factors that affect the growth of crystals in high-temperature glazes and examines ways to manipulate these to develop a desired technical and aesthetic quality. In particular, the paper examines the influence of the glaze recipe and the firing cycle.

EXPERIMENTAL

T-shaped test tiles were made so that the test glaze results can be seen on vertical as well as horizontal surfaces. Crystalline glazes have a low viscosity and hence they flow and run readily once they have been melted. The need to assess glaze results on vertical and horizontal surfaces has important implications for the creation of suitable types of ceramic forms to suit these glazes.

Six base crystalline glazes, both gloss and matt, were developed through previous experimentation. Colourants were added individually to the test glazes in increasing amounts and then they were added in combination with one another in varying ratios. The principal colourants being tested included manganese dioxide, cobalt carbonate, copper carbonate, red iron oxide, nickel oxide and chrome oxide.

Four different firing schedules were adopted that varied in top temperature between cone 9 to 11. Each schedule also varied in its rate of rise of kiln temperature, the length of the soak at top temperature, the rate of cooling to the crystal growing phase and length of time spent within this crystal-growing temperature range.

RESULTS AND DISCUSSION

The results indicated that within the glaze recipe and the firing schedule there were many variables that controlled the quality of the crystalline glaze.

The glaze recipe

The glaze fluxes used included barium, zinc oxide, sodium, magnesium and lithium as well as alkaline frits. All glazes needed at least 20% of zinc oxide for crystals to develop, with the fritted glazes being glossy and requiring a hotter firing (cone 11) and the barium and lithium containing glazes being satin-matt surfaces and requiring a cooler firing (cone 9-10).

The glazes all required the presence of titanium dioxide (up to 8%) as a seeding agent to assist the nucleation of the crystals. The titanium also acted as an opacifier in the glaze and helped in the formation of secondary crystals.

The quantity of colorants used in the glaze

Small changes in the amount of colorants used made significant differences in the final glaze result.

Firing conditions

Oxidising or neutral atmospheres in the kiln provided the optimal conditions for crystal growth with reducing atmospheres distinctly inhibiting their growth. Similarly, the firing cycles adopted for the glaze firings strongly influenced the glaze quality, i.e., the number and size of the crystals formed, the positioning of crystals on the ceramic surface, the shape of the crystals and the characteristics of the crystals themselves (growth rings, haloes).

The factors within the firing cycle of significance were:

- The rate of rise of the kiln
- The top temperature
- The amount of time spent at top temperature
- The rate of cooling
- The temperature at which the kiln is held for the crystal growth stage
- The length of time the kiln is held at this crystal growth stage

CONCLUSIONS

The quality of the glaze is influenced by the glaze composition, the thickness of application of the glaze and the firing schedule undertaken.

The glaze composition (and its additions of colorants) affects the colour of the crystals and the background. Secondary crystals can develop in this ground if titanium and magnesium are present in the glaze, as they each form silicates which are coloured differently to the primary crystals. Their inclusion in the glaze also determines whether or not haloes develop around the crystals.

The firing schedule controls the size, shape and number of crystals on the ceramic surface.

The top temperature reached (zone of nucleation) is important as it determines the number of crystals in the glaze. The temperature at which the kiln is held for crystal growth (zone of crystallisation) is significant as this determines the shape of the crystals from needle-shaped, Maltese-cross battleaxe shapes to round crystals.

The rate of rise of the kiln and the length of time spent at the top-temperature soak determine the amount of glaze that runs off the pot. This can be minimized with faster rates of kiln rise to top temperature and a reduced soak at top temperature.

Manipulating the glaze recipe and the firing schedule can successfully control the aesthetically desirable qualities of crystalline glazes (as sought by the authors).



Figure 1: Example of a controlled crystalline surface of a pot by the author 300 mm high x 290 mm wide.

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This paper was presented at the Austceram 2002, Perth, Australia.

OTHER PICTURES OF INTEREST CONTRIBUTED BY PETER WILSON



Figure 1: Controlled crystallisation of a vase.



Figure 2: Controlled crystallisation of a pot interior.

NEWS FROM FASTS

FASTS POLICY DOCUMENT FOR 2002

Professor Chris Fell President of the Federation of Australian Scientific and Technological Societies (FASTS), launched a new policy document, "Australian science: Investing in the Future" at Parliament House in Canberra on the 23rd September 2002.

Professor Fell states, recent years have seen a profound change in the way that science and technology are viewed. There is a national desire for Australia to be of world class in these areas, to capture the benefits of Australian innovation and to take nationally important decisions in the light of sound scientific evidence assessed by a scientifically literate community. There is also strong economic evidence that investment in scientific R&D yields a healthy rate of return.

One of the promising signs in Australia in this period is that both major political parties have increased their commitment to science and technology. The commitment has been accompanied by some modest (but welcome) increases in funding.

The missing ingredient is a commitment to a long-term strategy for Australian science and technology, a vision that would allow it to serve its rightful place as a driver of the economy and solution to our environmental problems. Science and technology lie at the heart of Australia's national development. They help establish new industries; enable existing industries to develop new and improved products; and provide a healthy environment.

The national strategy hovers tantalisingly just beyond our reach. We have parts of it, but not the whole. Some industries, some sectors, some government portfolio areas have a clear sense of direction, but the country as a whole does not. There is a view across the nation that Australia needs a national vision – an idea of where it wants to position itself over the next decade - and that market forces alone cannot ensure the nation's continuous improvement.

Visions and strategies are not just creatures of Government. The community generally and the sectors that make up the economy need to believe in and support a national sense of direction. The

role of Government is to create the structures from which a strategy will emerge, and to lead and promote it once it is in place.

The strategy needs to be supported by adequate funding, greater funding than we have ever committed to science. Australia always trails behind the main bunch in any international comparison of modern economies. We come eleventh, or fifteenth, or twenty-third; behind the leading countries of Europe, Asia and North America. Such a position would be intolerable in sport, but it seems to be accepted in science, a far more important measure to our prosperity and survival.

While Australia has made modest increases in funding, governments overseas have not been standing still. The US, the UK, Japan, countries in the OECD - all have success stories in promoting the level of R&D activity that Australia could successfully emulate. Both systemic and fiscal reform is called for.

The policies FASTS puts forward are the collective view of 60,000 working scientists and technologists. This is our attempt to change the national direction, to put in place the long-term strategies that will reap rewards for both the current generation and our children.

Professor Fell said the policy document puts forward a comprehensive set of policies aimed at driving Australia into the top third of OECD countries by 2012. There are actions for government, for business, for the education system, and for scientists.

The complete policy document is available as a pdf file at: <http://www.fast.org>.

*Australian Science: Investing in the Future
Presidents Foreword
Professor Chris Fell
September 2002*

Science Minister Peter McGauran received a copy of the policy document at the launch. Mr McGauran said "Many of the issues that concern FASTS are similar to that of the Government, but more importantly there is a high level of agreement as to how we should address the challenges outlined in the document". He stated "This Government places great value on Australian science and the work of Australian scientists. It is important that science policy is supported by a whole-of-government approach, as evidenced by *Backing Australia's Ability*.

“SCIENCE MEETS PARLIAMENT” DAY

"Science meets Parliament" Day has once again proven to be a wonderful opportunity for 154 scientists and technologists to put the case for science to the 128 Members of Parliament who agreed to participate.

Among the science and research issues currently being considered by Parliament are the Higher Education Review, priority research areas and triennium funding for Government-funded research agencies. These are matters where the science community has well considered views. The event generated good radio and newspaper coverage.

Tuesday 12th November. The National Press Club lunch was eloquently addressed by Dr Keith Williams, CEO of Proteome Systems Ltd. His company has rapidly expanded to be one of the world forces in proteomics, and employs about 60 PhD graduates). Lunch was followed by a comprehensive Briefing Session for the scientists. Lord Robert May, President of the Royal Society, Robin Batterham, Chief Government Scientist, John Tierney from the Liberal Party, ALP Science spokesperson Kim Carr, Senator Natasha Stott Despoja, the Speaker of the House and the President of the Senate all contributed to an informative afternoon. Education Minister Brendan Nelson, and Science Minister Peter McGauran hosted a Cocktail Reception at Parliament House.

Wednesday 13th November. After breakfast at Old Parliament House, society representatives commenced the rounds of appointments with MPs which continued through-out the day. There was a meeting with the Leader of the Opposition Simon Crean, a Press Conference given by a panel of young scientists and morning tea hosted by the Science Minister Peter McGauran. A new feature this year was a special dinner in the dignified and atmospheric Members' Dining Room at Old Parliament House, with guests drawn from participating scientists, from business and industry, and from selected Members of Parliament. The after-dinner speaker was Mr Bob Herbert, CEO of the Australian Industry Group. This dinner was arranged as an optional extra for participants wishing to build dialogue with MPs and industry.

Thursday 14th November. FASTS held the 2002 Annual General Meeting, Council Meeting and Board Meeting. The President-elect for 2003/2005 is Professor Snow Barlow, Head of the School of

Agricultural and Food Systems, University of Melbourne. Assoc. Prof. John Rice was re-elected as Treasurer, and Assoc. Prof. John O'Connor was elected as Secretary.

Key issues raised by federal Parliamentarians in 2002 are ranked in importance from 1 to 21:

1. Salinity; 2. Water quality; 3. Energy sources of the future; 4. Education & training—school, university and industry; 5. Commercialisation, innovation, industry research; 6. Climate, climate change, greenhouse; 7. Agriculture, agribusiness; 8. Sustainability & the triple bottom line; 9. Environment & biodiversity; 10. Health & medical issues; 11. Science in the local electorate; 12. Emerging technologies — nanotechnology, photonics, bioinformatics; 13. Medical & agricultural biotechnology: benefits & risks; 14. Broadband, Telstra & the bush; 15. Brain drain, recruiting; 16. Oceans & the Great Barrier Reef; 17. Stem cells, tissue engineering; 18. Nuclear power & storage— disposal of radioactive waste; 19. Mining, resource industries & exploration; 20. Defence science & biosecurity; 21. Feral animals, noxious weeds & quarantine.

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THE NEWSBULLETIN

Members are encouraged to supply news, articles, book reviews, etc, for inclusion in the *Newsbulletin*. Members are also invited to submit interesting images related to ceramics to feature on the front cover of the *Newsbulletin*.

APPLICATION OF FOCUSED ION BEAM MILLER IN FRACTURE CHARACTERISATION

Z. H. Xie¹, P. R. Munroe¹, M. Hoffman¹, R. J. Moon¹ and Y. B. Cheng²

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ABSTRACT

Focused ion beam (FIB) miller is a new tool used for the examination of micro-fracture in ceramics. In this work, a FIB miller was employed to investigate fracture events involved in indentation and scratch tests of two different α -sialon microstructures of the same chemical composition. The subsurface cross-sections were prepared via FIB milling and crack characteristics in both the surface and subsurface were identified. Crack interactions and the effect of microstructure on cracking were revealed.

INTRODUCTION

FIB millers are commonly found in the semiconductor industry, where they are used to deposit, etch, mill and image specimens during circuit modification and defect analysis. However, the FIB is becoming increasingly popular in studying fracture behaviour of ceramics, particularly for analysing subsurface damage following surface contact [1, 2].

The FIB uses a liquid metal ion source to emit gallium ions in a high vacuum environment. These particles are accelerated by an energy of between, typically, 5 and 50 keV, forming a fine (~10 nm diameter) energetic beam of gallium ions, which is then focused onto the specimen surface by electrostatic lenses. When the ions impact and/or implant into the specimen, secondary electrons, secondary ions and atoms are sputtered from the surface. If the beam current is large (~10nA), through the insertion of a large beam-limiting aperture, the sputtering rate is very high and sections can be milled rapidly into the surface of the specimen. This is achieved by using the system software to draw a "mill-box" on the area of interest, so that milling occurs locally around specific microstructural features. After milling the beam current can then be reduced to a lower level (~10 pA), by the insertion of a smaller aperture, and either the positive secondary ions or secondary electrons can be detected and used to form images similar to those acquired by a SEM. By using this method, subsurface features can be rapidly and precisely imaged. However, the FIB can be used in other ways, for example rastering the ion beam over the surface of specimen, at intermediate beam currents (~350 pA) will lead to localised surface etching and the generation of high contrast from

multiphase materials. In this way, the relationship between surface features, such as cracks, and microstructure, can be readily assessed [2].

These features of the FIB can be utilized for the characterization of cracks in ceramics. In the past, cracks induced in ceramics by either indentation [3] or scratching [4] were identified typically from direct observation on the sample surface using either optical microscopy or a SEM. When subsurface cracks became critical, either ceramographic polishing [5] or a bonded-interface technique [6] was used for the preparation of subsurface cross-sections. It is noted that both techniques may introduce damage into the original cracks and consequently affect the reliability of identification. Furthermore, the two techniques could not reveal the interaction of microstructure and cracks, which is vital to fracture analysis and design of tougher ceramics. However, using the FIB, the subsurface cross-sections of ceramics can be prepared rapidly with minimal damage. Further, the area of interest can be etched to reveal the effect of microstructure on cracking.

In this study, Ca α -sialon ceramic was used as a model material. The FIB was first used to characterize the indentation-induced cracks in the samples, and underscore the effect of microstructure on cracking and the interaction of cracks. Then, subsurface cross-sections of the samples were prepared using the FIB following scratch tests, to reveal how cracks were involved in the processes of material removal.

Experimental Details

Fine equiaxed (EQ) and large elongated (EL) grained α -sialon microstructure samples were fabricated with the same chemical composition defined by the formula $\text{Ca}_x\text{Si}_{12-(m+n)}\text{Al}_{m+n}\text{O}_n\text{N}_{16-n}$, where $x=m/2$, $m=2.6$ and $n=1.3$, based on different sintering schedules. Processing was described in an earlier work [7]. The two differing microstructures are shown in Fig. 1, and key microstructural parameters and mechanical properties are given in Table I.

Table I: Microstructure Features and Mechanical Properties of α -SiAlON in this work.

Sample Identification	EQ	EL
Average Grain Diameter (μm)	0.35	0.70
Aspect Ratio	1.1	7.2
Density (g/cm^3)	3.19	3.21
H_v (GPa) Load = 98 N	12.8 ± 0.5	12.0 ± 0.2
K_{IC} ($\text{MPam}^{1/2}$) Load = 98 N	3.7 ± 0.3	7.5 ± 0.3
Young's Modulus (GPa)	311.28	305.88

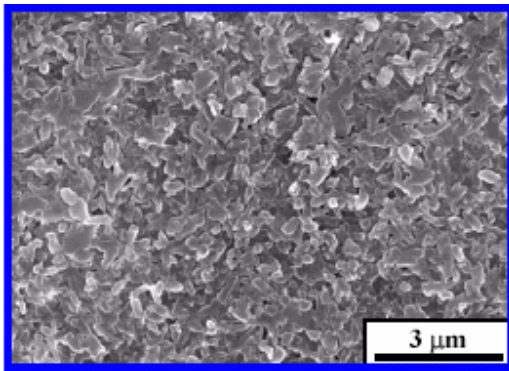


Figure 1a: Microstructure of Ca α -SiAlON EQ Material

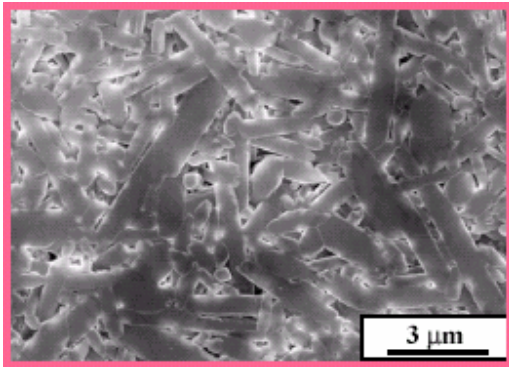


Figure 1b: Microstructure of Ca α -SiAlON EL Material. Note that the two microstructures are made of the same chemical composition, via different sintering schedules. Etched in molten NaOH and imaged by FESEM.

Samples were polished down to 1 μm diamond paste. All indentation and scratch tests were performed in laboratory air with a relative humidity of $\sim 60\%$. Vickers indentation was conducted at loads of 0.5 kg and 1 kg. Single-pass scratch tests were carried out at a constant load of 10 N and a constant velocity of 1 mm/s using Vickers pyramid indenter and the sliding direction was parallel to the pyramid diagonal.

The FIB was used in two fashions. Firstly, the beam was rastered over the sample surface to show the correlation between surface structure and cracking. Secondly, cross-sections were prepared through indentation-induced cracks via FIB milling processes, allowing for subsurface observation to be performed.

RESULTS AND DISCUSSION

Indentation Tests

Radial cracks formed in both the EQ and EL samples during Vickers indentation. The crack propagation and the effect of microstructure on cracking for EL can be seen in Fig. 2. Crack bridging by the elongated grains in this material can significantly reduce the propagation of cracks, resulting in higher indentation fracture toughness relative to EQ (See Table I). No similar crack bridging was observed in EQ due to its fine-grained microstructure. By comparing the molten NaOH etched microstructures in Fig. 1 with the ion beam etched microstructure in Fig. 2, it can be seen, if the chemical etching were used, most of the crack configuration information would have been etched away with grain boundary glass phase.

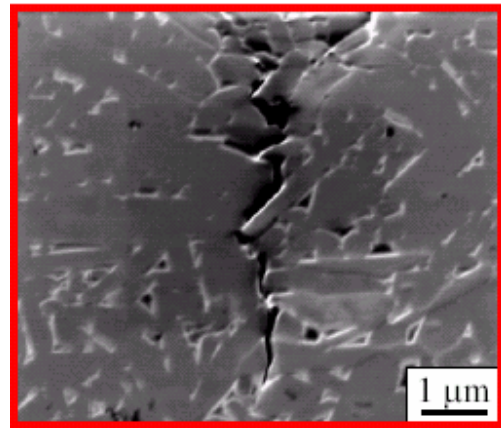


Figure 2: Radial crack propagating from the corner of a 0.5 kg load Vickers indentation of EL surface. Crack bridging can be seen after ion-beam etching.

Lateral cracking and its interaction with radial cracks can be revealed via the preparation and observation of a subsurface cross-section of the indented sample, as shown in Fig. 3. The propagation direction of the lateral crack appeared to be affected by the presence of a radial crack. Close to the radial crack, the lateral crack was drawn to the surface. However, away from the radial crack, the lateral crack tended to propagate away from the surface. This observation is consistent with the recent reports of cracking induced by Vickers indentations on silicon nitride [5] and sodalime- silica glass [8].

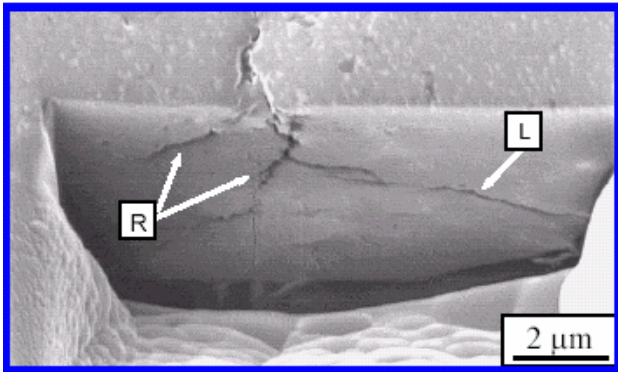


Figure 3: The subsurface cross-section of a 1 kg load Vickers indentation of EQ surface, showing the interaction of radial and lateral cracks. Note that R= radial crack, L= lateral crack.

It has been demonstrated that interaction of indentation-induced cracks and the effect of microstructure on crack growth could be revealed by the FIB. Likewise, the FIB miller can be employed to analyse surface damage occurring during sliding contacts in ceramics, such as scratches, as described below.

Scratch Tests

A detailed examination of crack growth induced by a Vickers indenter scratching on EQ was conducted using the FIB. As shown in Figure 4, with the left-corner arrow showing the scratch direction, radial cracks can be seen propagating away from the scratch track, and penetrating at an angle forward of the sliding direction, then turning upwards and popping out of the surface under the tangential force of the indenter. The lateral cracks below the scratch track were observed at two different depths: $<1 \mu\text{m}$ and $>2 \mu\text{m}$. Lateral cracks that formed within $1 \mu\text{m}$ of the surface were connected to the parallel surface cracks that run perpendicular to the scratch track. Lateral cracks that formed at $>2 \mu\text{m}$ below the surface were more significant, and led to material removal along the scratch track.

This observation indicates that radial cracks, connected by lateral cracks, were responsible for material removal occurring along the sides of the scratch track and outwards. In contrast, the lateral cracks alone accounted for the material removal taking place inside the scratch track. By the use of the FIB, the mechanisms that control material removal during scratching in ceramics can be explored in depth with high efficiency and flexibility, as highlighted here.

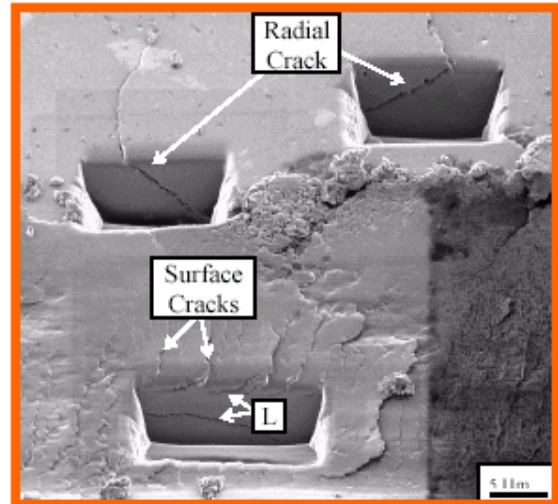


Figure 4: EQ following scratch test at a load of 10 N showing surface and subsurface damage. Note that L= lateral crack.

CONCLUSIONS

The FIB miller is a valuable tool in characterizing surface contact-induced fracture. Utilizing the FIB in this investigation, the following conclusions can be drawn: 1) Elongated grains can improve the indentation fracture toughness of ceramics via suppressing the growth of cracks; 2) The propagation direction of lateral cracks was observed to be affected by the presence of radial cracks; 3) The radial cracks, connected by the lateral cracks, were responsible for material removal occurring along the side of the scratch track and outwards. Lateral cracks alone accounted for material removal occurring inside the scratch track.

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This paper was presented at The 2nd International Symposium on Advanced Ceramics, Shanghai China.

WHAT'S NEW

A TO Z OF MATERIALS

AZoM.com Set to Become Number 1 Materials Portal on the Web: AZoM.com, the A to Z of Materials continues its rapid growth in site traffic. Every month since its launch has seen record numbers of visitors accessing the ever-increasing supply of information supplied free by AZoM.

Since September 2001, when AZoM was official opened to the public, it has recorded almost 9.5 million hits and hosted over 400,000 site visitors. This year alone has seen visitor numbers swelling with numbers almost doubling every quarter.

"Current visitor rates indicate 100,000 site visitors a month before the end of the year", said AZoM CEO, Dr. Ian Birkby.

When asked why AZoM is performing so strongly, Dr. Birkby explained "Our customer feedback indicates that AZoM's growth can be attributed to two main factors, firstly, the breadth and quality of the materials information on AZoM.com and secondly, the wide range of search options which are available."

Dr Birkby continued, "Purchasers of materials simply like the AZoM.com experience. We have many examples of global multinationals who visit AZoM.com over 30 times a month."

"We have also looked to constantly improve the AZoM experience, continually developing the site and offering more services, such as our AskAZoM, natural language search facility and the AZoM Bookshop. We also supply up the date news helping to keep the materials community aware of what is happening in their world without them having to comb the web for themselves."

"The success of our concept is evidenced not only by the ever increasing number of site visitors, but also by the growing numbers of materials suppliers and

consumers worldwide that are signing up for AskAZoM and our monthly newsletter, MyAZoM."

"Materials suppliers are recognising the power of the web as a marketing tool. They acknowledge that the web is now the first port of call for consumers and that a targeted marketing effort is the best approach."

This trend was reinforced by the 50 delegates who attended a "Materials Marketing and the Web" seminar Dr. Birkby gave in November at CERAM Research Ltd. UK.

After giving the seminar, Dr. Birkby found that "most people understood the value of their web site and its importance in their marketing strategy, but very few knew how to optimise its performance to help generate new business. Delegates were fascinated at how AZoM had made such a rapid rise and become such a powerful resource."

The delegates now understand how easy it is for AZoM to manage their materials information and how widely it is distributed by hosting their materials information on AZoM.com.

Based on the success of the UK seminar, AZoM will be running similar run the seminars in Sydney and Melbourne early in the New Year.

If you would like to find out more about the proposed materials marketing seminar or how AZoM can help your online strategies, please do not hesitate to contact Dr. Ian Birkby.

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WHAT'S NEW



STRESS DISTRIBUTION AND MAGNITUDE MEASURED BY NEW SYSTEM

Sensor Products Inc. introduces the Topaq[®] Advanced Imaging System. Used in conjunction with Fuji Prescale/Pressurex stress indicating films, Topaq provides a unique perspective of the distribution and actual magnitude of stress between any contacting or impacting surfaces. Unlike FEA, Topaq is a post-process interpretative system that actually collects stress and force data at the interface surface. In many instances, Topaq can be used to confirm the results of FEA analysis. Topaq has extremely rapid response time usually requiring no more than five seconds to render an image. In general, any application involving stress between two objects could benefit from Topaq's capabilities. Measuring pressure distribution and magnitude in components, tools and machines as well as determining effective placement of strain gauges and drawing pressure in dies are some of the common applications using Topaq. Electronics packaging applications, heat sinks and PCBs lend themselves particularly well to interpretation with this unique system.

Some of Topaq's features include histograms of pressure levels, enlargement and reduction, pseudo-colour and 3-D viewing modes, extensive smoothing, filtering and thresholding enabling integration of total area and magnitude of force. Surface contact area down to 3 mm can be analyzed. Multiple and single regions of interest can be compared and analyzed. A line scan function allows the user to assess narrow bands of stress over unusual or intricate shapes. Another feature called Grid-Maker applies a user designated mesh overlay to an image and quickly assimilates the statistical data for each cell into Excel format. A bicubic interpolation algorithm allows Topaq to enlarge an image without the usual increase in graininess that normally accompanies such function. Each image and its accompanying statistics can be saved, printed and exported for analysis in other software packages.

For a free brochure or more information on the Topaq pressure analysis system, contact Bill Ebner.



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<http://www.sensorprod.com/topaq.html>



NEW REUSABLE ELECTRONIC TACTILE SURFACE SENSOR UNVEILED

Sensor Products Inc. introduces Xsensor, a new electronic tactile force and pressure indicating sensor. Xsensor allows an engineer to monitor precisely how force is disbursed between any two contacting or mating surfaces in real-time while the event occurs. Any application of test where pressure lies between 0.1 PSI to 900 PSI (0.007 kg/cm² to 632.7 kg/cm²) is a viable candidate for Xsensor technology.

Xsensor is a valuable aid in R&D and QC/QA in ceramics fabrications in areas ranging from electrical applications to brick making. In electrical ceramic packaging Xsensor technology can help reveal unevenness in forming and pressing parts, thereby helping prevent cracking during shrinkage. In general, Xsensor is useful in revealing pressure variations between all contact surfaces, regardless of the process, whether it be rolling, pressing, forming and stamping.

Xsensor is a Windows-based system that consists of an electronic sensor element "skin", an interface controller, and software. The sensor skin is essentially a thin flexible sheet that is densely packed with sensing points or pixels. These sensing points can be spaced as close as 1 mm (0.04") apart and can collect data as rapidly as 600,000 points per second. The Xsensor sensing element is only 18 mm thick, allowing adaptation over curved surfaces or invasive intolerant environments. The Xsensor element's internal structure is very durable and can be utilized for thousands of tests before replacement is necessary. The sensor system is pre-calibrated and requires minimal user training prior to operation.

System requirements for use of Xsensor are Windows 95/98/2000/XP, 16 MB free disk space and 64 MB RAM. For more information, please contact Bill Ebner. You may also visit our company website at www.sensorprod.com.

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<http://www.sensorprod.com>

CERAMIC INSERTS FOR HEAT-RESISTANT ALLOYS

TaeguTec, represented by Hard Metals Australia, has launched a new ceramic grade of turning insert for high speed machining of the ultra-tough heat resistant alloys used in the aerospace industry, helping manufacturers dramatically cut both tool costs and machining times.

The strength and heat resistant properties of TaeguTec's AS20 turning inserts means high nickel content materials, such as Inconel 718 and Waspaloy, can be turned at speeds of up to 350 m/min - six times faster than standard ceramic inserts.

The speed and feed rates of the AS20 match that of the only other insert capable of cutting at such speeds - whisker ceramics. However, the technology behind the AS20 also offers OEMs considerable cost savings, greater reliability and tool use.

Made from a silicon nitride and titanium nitride compound ceramic, specially developed for this sector by TaeguTec's dedicated research centre in Korea, the AS20 differs dramatically from whisker inserts.

The AS20 does not need the fine lattice structure that whisker inserts rely on to give them the strength to withstand the high temperatures, strength and heat resistant nature of alloys like Inconel 718.

This greatly reduces the inserts' production costs, with the AS20 currently costing around 40 per cent less than whisker inserts, a saving TaeguTec passes directly back to the user.

Tests show, in addition to lower unit costs through more efficient production, the AS20 also allows for interrupted cuts - thereby increasing tool life further.

The high temperatures generated when machining nickel-based materials makes the use of coolant necessary, although this can also cause unpredictability of performance in whisker inserts.

The AS20, in contrast, is able to withstand higher temperatures than whisker-type ceramics and therefore gives more reliable performance. TaeguTec's tests show the AS20's toughness was 6.5 Mpam^{1/2}, compared with 5.5 Mpam^{1/2} for whisker ceramics.

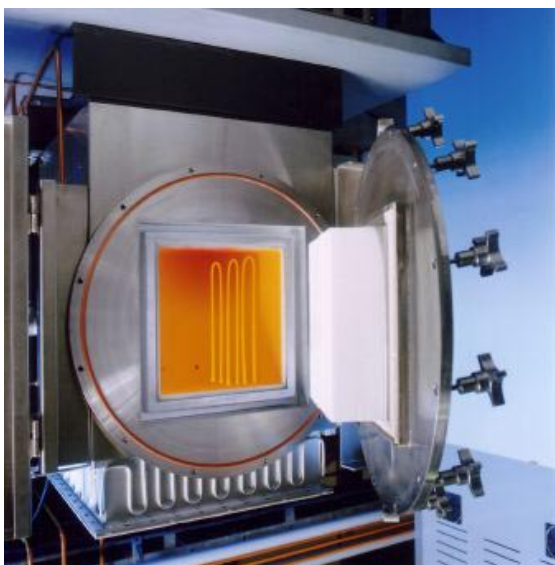
*Article taken from:
Dial Info Link Manufacturing
Products and Services in Manufacturing
<http://www.dialinfoLink.com.au>
10 July 2002*

NEW RANGE OF CUSTOMISED HEATING ELEMENTS

In a further development of its concept of producing customised, furnace heating systems for specific and demanding applications, Kanthal AB has launched five new grades of Kanthal Super heating elements.

The company recently launched several new products in its Superthal range of heating modules.

Designed for use at very high temperatures, the key feature of the new Kanthal Super elements is that they work directly in the furnace atmosphere without muffles to protect them.



A multi-atmosphere furnace with Super ER elements in the atmosphere.

Suitable for nitrogen, hydrogen, vacuum and mixtures of endogas and reducing furnace atmospheres, Kanthal Super elements are ready-made for use in production and laboratory furnaces in the glass, steel, electronics, ceramics and heat treatment industries.

One new element, Kanthal Super ER offers the benefit of working in a range of different furnace atmospheres. It is now possible, therefore, in one furnace, to operate firing cycles where the atmosphere condition can be altered, during the cycle, between oxidising, inert, endogas and reducing atmospheres.

Suitable for temperatures up to 1600°C, Kanthal Super ER elements are equally suitable for oxidising processes. Another benefit is that they can be replaced, if necessary, whilst the furnace is hot, minimising downtime.

The main applications are seen as most types of sintering furnaces working in reducing atmospheres such as dry hydrogen, nitrogen and endogas.

Kanthal Super RA has been designed specially to work in nitrogen atmospheres at temperatures above

1250°C and to minimise the problems of element scaling caused by nitration.

At temperatures above 1250°C in nitrogen atmospheres, the protective 'glaze' on elements is consumed, sometimes causing silicon nitride to be formed, leading to scaling.

Kanthal Super RA withstands nitration at high temperature better than any other existing Kanthal Super element. Main applications are in different types of industrial furnace for heat treatment, forging and sintering.

The third new element, Kanthal Super HT has outstanding high temperature properties in air or oxygen, cycling conditions. Its maximum operating temperature is 1830°C, making it suitable for laboratory and high temperature process furnaces.

The special feature of Kanthal Super HT is much reduced and controlled growth of the oxide layer or 'glaze' which leads to a longer element life. Other properties include better hot strength and form stability.

Designed for use in 'clean' process heating, up to 1800°C, in the research and electronic industries, Kanthal Super NC offers minimum scaling of the element surface. The metal content is also reduced which means less diffusion into the furnace atmosphere.

Kanthal Super LC has an element configuration which creates a higher resistance than ordinary 'U' type elements. As a result, the power system can be designed for elements in series, connected directly to the line voltage and eliminating the need for transformers.

Suitable for temperatures up to 1550°C in air/oxidising atmospheres, Kanthal Super LC can be used in most types of industrial furnace at an overall lower cost.

*Article taken from:
Dial Info Link Manufacturing
Products and Services in Manufacturing
<http://www.dialinfoink.com.au>
26 November 2002*

CORPORATE NEWS

BRICKWORKS SAYS NEXT SIX MONTHS LOOK RESPECTABLE

Clay products maker Brickworks stated 27th August 2002 that its strong order bank, combined with a full construction pipeline, should see the company book a respectable first six months of 2002/03.

The Sydney-based group announced its net profit after tax of \$51.9m, was down 13.5% on the previous year. On a normalised basis its profit after tax jumped 37% to \$51.9m.

When comparing the profit of 2001, the result should be adjusted to \$37.9m, from the reported \$60m figure, for the one-off \$22.1m contribution of the API transaction in Washington H Soul Pattinson & Co in 2001, which was equity accounted to Brickworks.

The 2001/02 result was driven by strong sales revenue of \$149.7m, up 25.3%. Brickworks managing director Lindsay Partridge said he expected a slowing housing market in 2002/03, however low stocks and the closure of a competitor's plant should offset the impact on volume and prices of any slowdown.

"The group performance is expected to benefit from Bristile's contribution and exposure to the floor tile market which has enjoyed consistent growth for more than 30 years as well as solid performance from investments," he said.

Brickworks received a \$22.1m abnormal profit gain in the first half of 2000/01 after its 43% owned Soul Pattinson merged its pharmaceutical division with Australian Pharmaceutical Industries in May 2000.

Brickworks investment income (dividends and realised gains) of \$23.8m was up 5%. The total investment portfolio returned 27% including unrealised gains compared with a negative 4.5% from the S&P/ASX 300 Accumulation Index over the same period. At June 30 the value of the total investment portfolio stood at \$880.3m, up from \$642.2m in June 2001.

The portfolio includes the \$85.2m purchase of Bristile shares. Brickworks said the NSW and Queensland markets continued to perform well and approvals have remained relatively robust.

"The strong order bank, combined with a full construction pipeline, should see a respectable first six months," the company said, referring to the 2002/03 fiscal year.

"The shortage of land in the greater Sydney area will probably cause many housing companies to experience financial difficulties over the next 12 months, even though there is unsatisfied demand," it said.

Brickworks' Austral Brick Company was boosted by a strong domestic economy and the lowest interest rates in a generation in 2001/02. The group said the subsequent reduction of the first home owners grant to \$10,000 on June 30, 2002 has moderated housing sales. "Most building industry forecasters are predicting a downturn of approximately 10% in 2002/2003," it said.

The clay products divisions lifted revenue 26% to \$149.7m and earning before interest and tax (EBIT) by 40% to \$26.5m. The result included a full year's contribution from Bowral Bricks and one month of Eureka Tiles Australia.

Stock levels dropped during the year falling to \$22.3m (excluding Eureka Tiles) from \$25.2m previously. The operation is in a strong position to run factories at full capacity over the coming year.

In May 2002 the Austral Tile Company purchased Eureka Tiles for \$3.7m cash and \$9.5m debt. The combination of Eureka Tiles and Austral Tiles has formed Australia's largest floor tile producer with capacity approaching two million square metres per annum.

The combined company is trading under the name Eureka Tiles Australia. Meanwhile, the contract for the first stage of filling the quarry at the Eastwood site has been awarded.

*Article taken from:
Dial Info Link Manufacturing
Products and Services in Manufacturing
<http://www.dialinfolink.com.au>
28 August 2002*

BRISTILE FORESHADOWS IMPROVED EARNINGS IN 2003

Australia's second biggest brick and tile maker, Bristile released on the 30th October 2002, that investors could look forward to improved profitability and possibly higher dividends in 2003.

Managing director David Gilham told reporters after the group's annual general meeting in Perth the start of 2002/03 had exceeded the group's expectations. "The building approvals in July and August were stronger than expected and that really relates for us to sales going through until March/April," Gilham said.

The Perth-based company recorded a net profit of \$39.31m, slightly less than the \$39.77m profit recorded in the previous year. However, excluding one-off items, the result represented a 28% increase over last year.

A full year contribution from Pioneer Roof Tiles, which it acquired in November 2001, cost cuts from the relocation of the Nubrik masonry operations in Victoria and the strong order book were expected to drive Bristile's earnings higher in 2002/03. "I expect the group will continue to improve profitably in the current year," Gilham told the AGM. "I believe we will have a very strong first half result and a very acceptable result in the second half as well."

The company remains non committal about a share buyback but remains on the look out for acquisitions. But Gilham said Bristile would not be hurried into a deal. "If something comes up we will look at, but in the meantime, we've got a very successful business...and we've got a market in housing that is going to crank up a bit more every year for the next three years, it is not a bad position to be in."

Gilham also dismissed recent comments by renowned corporate raider Sir Ron Brierley about the possible merger of Brickworks' clay products division, Austral Bricks Co with Bristile, of which Brickworks holds almost 22%. Once restructured under Sir Ron's model, Brickworks would be purely an investment company with no reason to remain listed, with a takeover by Soul Pattinson "the clearly logical response". Soul Pattinson owns 49% of the ordinary share capital of Brickworks, which also owns 42% of Soul Pattinson. "I think his comments were really more targeted with Brickworks and with Soul Pattinson, he has had a long running battle there," Gilham said. "To suggest we buy a business and issue shares and allow control to pass without a

premium being paid shows I don't think he was really serious when he wrote it."

*Article taken from:
Dial Info Link Manufacturing
Products and Services in Manufacturing
<http://www.dialinfolink.com.au>
31 October 2002*

CSR JOINS HANSON & QUEENSLAND CEMENT TO FORM AUSTRALIA'S LARGEST CEMENT GROUP

CSR Limited announced today that its 50-50 cement joint venture with Hanson PLC, Australian Cement Holdings Pty Ltd (ACH), will merge with Queensland Cement Ltd (QCL), to form Australia's largest cement group, with turnover around \$750 m.

The new group - which is still to be named - will be an Australian company, owned 50% by Holcim and 25% each by CSR and Hanson.

It will produce around three million tonnes of cement annually, from three principal plants – Gladstone, in Queensland (currently a QCL plant), Railton in Tasmania (ACH) and Kandos in New South Wales (ACH).

CSR Limited Managing Director Peter Kirby welcomed the merger. "The new company will have a network of plants and terminals capable of providing better service to a wider group of customers in the eastern states," he said.

"It significantly enhances the utilisation of capital for all parties, and will enable us to compete more effectively in a very competitive international market.

"ACH mainly supplies the NSW and Victorian markets, whilst QCL mainly supplies Queensland and export markets, so there is very little overlap. However, the merger offers cost savings in areas such as logistics and corporate overheads. QCL's excess cement capacity at Gladstone will be used to supply Hanson and CSR in the NSW market, which will obviate the current need for ACH to invest heavily in lifting capacity in NSW," he said.

The transaction is expected to be earnings neutral in the first year, and earnings positive thereafter. The Board and management are still to be appointed. The board appointments are expected to reflect the shareholdings of the new company.

Subject to regulatory approval by the ACCC and the

due diligence process, the merger is scheduled for completion during the first quarter of 2003.

*Article taken from:
CSR Website
<http://www.csr.com.au>
26 November 2002*

BORAL TO UPGRADE NSW & VIC CEMENT PLANTS

Boral announced on the 7th December 2002, that a \$131m upgrade of its cement plants in the New South Wales southern highlands and in Geelong, Victoria, which will produce \$25m annual cost savings from 2004/05.

Approximately \$75m will be spent to upgrade one of Boral's dry process kilns at its Blue Circle Southern Cement plant at Berrima in NSW. The upgrade will lift the capacity of its No. 6 kiln to 1.4 m tonnes per annum (tpa), which will result in substantially reduced operating costs.

The move would also further improve Berrima's competitiveness, which the company said was already the low cost cement supplier into the NSW market. The upgrade will result in a 400,000 tpa increase in dry kiln capacity.

Boral said the upgrade would allow the plant to mothball its No. 5 kiln, a 450,000 tpa higher cost, wet process kiln, which supplied the NSW and Victorian cement markets.

A further \$40m will be invested in the stage two upgrade of its Waurrn Ponds plant in Victoria. Boral said the investment was in addition to the previously announced \$16m, stage one upgrade of Waurrn Ponds' grinding capacity.

Blue Circle Southern Cement managing director Philip Jobe said he anticipated cash cost savings in the order of \$25m per annum as a result of the planned upgrades at Berrima and Waurrn Ponds from 2004/05.

"Additionally, upcoming replacement capex of around \$30m will be avoided," he said. "The Australian cement market had been largely dependent on imports to supplement domestic production.". He said Boral would now be well positioned to meet demand surges and to supply growth in the building and construction markets, which were not expected to achieve a cyclical peak until 2006/07.

Stage one of the Waurrn Ponds upgrade is expected to be completed by March 2003 while the Waurrn Ponds stage two and the upgrade of the Berrima kiln will be fully commissioned by the end of the 2004 financial year.

*Article taken from:
Dial Info Link Manufacturing
Products and Services in Manufacturing
<http://www.dialinfolink.com.au>
9th December 2002*

ZIRCAR CERAMICS, INC. REACHES EAST & FORMS STRATEGIC ALLIANCE



Pictured above are Beijing Naoi Kizai's Managing Director Shigeo Yasukawa and ZIRCAR Ceramics Inc.'s Vice President David Hamling celebrating the recent establishment of their strategic alliance.

A significant part of this alliance includes the establishment of stock of many of ZIRCAR Ceramics' standard high temperature thermal insulation and ceramic fiber products in China. Based in Beijing, Naoi Kizai has been manufacturing ceramic fiber textiles for nearly 15 years. ZIRCAR Ceramics has a 25-year history of producing high-performance ceramic fiber products. ZIRCAR Ceramics' Chinese inventory is expected to be in place in early February 2003.

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NY 10921 USA
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Email: dph@zircarceramics.com
<http://www.zircarceramics.com>
17th October 20*

WELCOME TO NEW MEMBERS

Mr. Geoffrey Carter
Millennium Chemicals
WA

Surendra Jhunjhunwala
Orind Exports Ltd.
India

Mr. Gerald Ng
Saint-Gobain Industrial Ceramics Pty Ltd.
VIC

Prof. Derek Northwood
University Of Windsor
Ontario, Canada

Dr. Denis Whitfield
University Of Western Sydney
NSW

Mr. James Hos
University of Western Australia
WA

Mr. Kenneth Hew
WA

Mr. Nigel Chen-Tan
WA

Dr. Philip Ritchie
Ceramic Fuel Cells Ltd.
VIC

Mr. David Lea
Concord Engineering Co.
WA

CALENDER OF EVENTS

Ceramics and Ceramic Technologies Exhibition & Glass Processing & Glazing Conference

March 16-18, 2003, New Delhi, India

Contact: Sunita Thukral

e-mail: sthukral@servintonline.com

2nd International Conference: New Biomedical Materials

April 5-8, 2003, Cardiff, Wales, UK

Contact: Dr. Parvez I. Haris

e-mail: pharis@dmu.ac.uk

2003 International Conference on Powder Metallurgy & Particulate Materials

June 8-12, 2003, Las Vegas, USA

PACRIM 5

September 29 – October 2 2003, Nagoya, Japan

FASTS "Science meets Parliament" Day 2003

October 14-15, 2003, Canberra, Australia

Ceramic Processing E-zine

brought to you by: Dinger Ceramic Consulting Services

Ceramic Processing E-zine is a free monthly publication which will be distributed to all interested ceramists. Each issue of Ceramic Processing E-zine will contain one or two brief articles that touch on fundamental topics in ceramic processing, or on simple computer applications that can help with ceramic processing calculations. Readers are encouraged to submit suggested questions they'd like to see addressed in articles of subsequent issues.

Although this is a free monthly publication, each person must add his or her name to the distribution list. To receive Ceramic Processing E-zine go to <http://www.dingerceramics.com/SubscribettoCPE.htm> add your name and e-mail address to the mailing list and your subscription will be complete. To suggest topics you would like to see addressed in upcoming issues, send them to: questionsandcomments@DingerCeramics.com

BRIEF HISTORY OF THE AUSTRALASIAN CERAMIC SOCIETY

The Society's roots lie in both New South Wales and Victoria. In New South Wales, it had its genesis in the Department of Ceramic Engineering at the University of New South Wales (UNSW) which had been established in the late 1950's under the late Professor Eric McCartney. In 1961, a meeting was called by Professor McCartney of all Sydney ceramists interested in the possible formation of some kind of Ceramic Society. The keynote speaker at this meeting was the late Len Cane, whom I believe became Chairman of the 'Ceramic Society of New South Wales' which resulted from this meeting.

This infant Society progressed rapidly. In 1962, its name was changed to 'The Australian Ceramic Society' and a decision was made to hold the First Australian Ceramic Conference at UNSW in that same year. In 1964, another bold decision was made, namely to incorporate the Society as a public company in New South Wales under a legally-binding Memorandum and Articles of Association. In 1965, the Society's 'flagship' Journal - J. Aust. Ceram. Soc - was launched, and in 1966 the Second Australian Ceramic Conference was held, this time in Melbourne.

In Victoria, events were moving in parallel. Another Australian Ceramic Society, which had been inactive for some years, was reactivated in the early 1960s. This situation of two similar Societies could obviously not be allowed to continue for long, so discussions on amalgamation were begun. These culminated in the setting-up of a Federal Liaison Council (FLC) which first met in Sydney in November 1966. The FLC met twice-yearly until November 1970, when full amalgamation under the NSW Memorandum and Articles of Association was achieved. At the same time, the pre-existing logo of the Victorian-based Society was adopted for the newly-strengthened Society, and it remains our proudly-displayed logo to the present day.

*Dr. Keith Reed
Founding Member and Past Federal Secretary of the
Australasian Ceramic Society*

*This article was taken from the Australasian Ceramic
Society's Website.
<http://www.ozemail.com.au~ausceramsoc>*

CERAMIC LINED EXTRUSION DIE STILL GOING STRONG

Around 1980 Taylor Ceramic Engineering (TCE) made the first Ceramic Lined Extrusion Die in Australia (and most probably the world) for Mashman's Pottery located at Kingsgrove NSW. At the time Mashman's were still firing in oil fired down draft period kilns and utilising very traditional pottery making techniques; extrusion, pressing and hand-forming, their hand forming methods now go back two centuries, making this pottery somewhat unique. Their extrusion dies at the time were steel and gave only a short life of a month or two; however size variations always posed a problem with their "Quarry Tiles" as the dies wore. At the request of the Late Tim Mashman (one of the long line of Mashman Potters) TCE was asked to provide a solution to this problem via wear resistant ceramics. Thus the first Ceramic Lined Extrusion Die came into being, following some very serious design work by David Taylor at TCE. The final design utilised the well-known "Split Tile" approach (previously they extruded only single tiles) with a groove feature to assist laying. A pneumatic tile splitter was also designed and made by TCE to facilitate the post-firing separation on the tiles, all this was new technology to Mashman's at the time.

Recently the die was returned to TCE for checking due to a query re die size. Upon inspection and reference to the original die drawings, it was found that the die had only worn 1 mm in width over the past twenty odd years and is still within making limits. Following a general inspection and cleanup, plus a bit of paintwork the die has gone back into service – will it be another twenty years? It is felt that this performance may well be somewhat of a record. When Mike Mashman (a fifth generation Mashman and the current head of Mashman's) was asked to estimate the number of tiles produced, Mike's reply was "Must be B... Millions". Mike then went on to say that the most outstanding performance has been by their "Dump" die (made by TCE around six months after the Quarry tile die). This die provides extruded slugs "Dumps" for wet pressing and hand forming work and works far more than the extrusion dies. Following the success of the first die, TCE went on to provide a full range of extrusion dies to Mashman's. These dies are also going strong and will be around for many years to come.

This interesting application serves to highlight the advantages of wear resistant ceramics. A secondary aspect of this application is indirectly, the environmental component; no steel has been used

over the years, so a small saving in greenhouse gases?

*David Taylor
Taylor Ceramic Engineering*

THE AUSTRALASIAN CERAMIC SOCIETY

THE SOCIETY

The Australasian Ceramic Society is an organisation that works towards furthering all aspects of ceramics - science, industry, research, trade and in art. The society aims to bring together all those interested and involved in ceramics for mutual cooperation and the exchange of knowledge and ideas.

FEDERAL COUNCIL OFFICERS

The Society has a Federal Council comprised of representatives from the member branches. These are in New South Wales, Victoria and Western Australia and each operates autonomously with its own Committee. There are corresponding Secretaries in Queensland, South Australia and New Zealand.

ACTIVITIES

Meetings

Regular meetings are held by the member branches. The meetings are usually comprised of informal social gatherings and lectures by invited speakers. Occasionally, there are joint meetings with kindred societies.

Conferences

The Society holds its AUSTCERAM conferences every two years. Since 1988, the AUSTCERAM conferences have become events on the international conference agenda. The conferences cover all aspects of the ceramic area and present both new work and reviews.

Scholarships & Prizes

Several Society scholarships and prizes are given to students undertaking courses in ceramics at tertiary level.

Awards

The Australasian Ceramic Society Award is given every two years to a person who has made a major contribution to ceramics in Australasia. The award encompasses all fields of ceramics. Eligibility is not

restricted to Society members. There are also other awards, as determined by the Council.

Excursions

Visits are regularly organised to ceramic research establishments, manufacturing plants, raw material deposits and so on, often in conjunction with Technical Meetings.

PUBLICATIONS

Journal

The Journal of the Society is circulated internationally with a particular concentration in the Australasian region. It contains papers on original ceramic research and industrial development as well as review articles. It is published annually and is sent free to members. The Journal may be subscribed to independently of Society membership.

Newsbulletin

The Newsbulletin is the Society's vehicle for news, information and comment. It contains notices, reports of Society activities and other events, letters, articles, opinions, news of members, industry news and other items of interest and concern. It is published four times a year and is sent free to members. Advertising in the Newsbulletin is available to members and others.

Conference Proceedings

Conference proceedings contain the papers presented at the AUSTCERAM conferences and are a comprehensive record of progress and developments in ceramics both in the Australasian region and internationally. Proceedings from past conferences are still available. Future publications will be on CD ROM or diskettes.

Library

The Society has a library of journals and books on ceramics for use of its members. It is housed in the School of Materials Science and Engineering at the University of NSW.

MEMBERSHIP INFORMATION

Membership is open to all individuals, companies and associations. There are five categories of membership.

Ordinary Member

Benefits of Ordinary Membership include automatic subscription to the Journal, receipt of the Newsbulletin, and notices of Society activities.

Corporate Member

Corporate Members may nominate two representatives as members and receive free advertising space in a Society publication on one occasion.

Honorary Life Member

This is an honour awarded by the Federal Council to members who have given long and distinguished service to the Society.

Retired Member

Persons who have retired from their profession may apply for Retired Membership at a reduced rate. Retired members receive all the benefits of members.

Student Member

Full time students are entitled to Student membership at one quarter membership. Student members receive all the benefits of Ordinary Membership.

CURRENT ANNUAL MEMBERSHIP FEES

	Cost	GST	Total
One time joining fee	\$10.00	\$1.00	\$11.00
MEMBER	\$80.00	\$8.00	\$88.00
CORPORATE MEMBER	\$200.00	\$20.00	\$220.00
RETIRED MEMBER	\$40.00	\$4.00	\$44.00
STUDENT(no journal)	\$15.00	\$1.50	\$16.50
STUDENT (inc. journal)	\$25.00	\$2.50	\$27.50

*No GST for overseas members



NEWSBULLETIN ADVERTISING CHARGES

The costs for 1/4, 1/2 and full page advertisements in the *Newsbulletin* are \$400, \$600 and \$940 respectively. In addition to this full page colour advertisements cost \$1400. Advertisements are published in the *Newsbulletin* for one year (4 issues).

Companies which advertise in the *Newsbulletin* receive an automatic link to their homepage in the website of the Australasian Ceramic Society.

Please contact the Editor of the News Bulletin if you are interested in advertising in the *Newsbulletin* and receiving a link to your website.



Australasian Ceramic Society

ABN 81 000 468 708

C/o ANSTO, PMB 1 Menai, NSW 2234, Australia

Membership Form

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State	
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Email	
Fax	
Membership Type*	

*(Ordinary member, retired member, corporate member, student member)

For Corporate Members Only, Please State Company Nominees

1. Title		Name	
2. Title		Name	

Cost for Membership

One-time Joining Fee:	AUD \$11.00
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NEWSBULLETIN
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THE AUSTRALASIAN CERAMIC SOCIETY