Management of Materials Research: Protection and Commercialisation of Nanotechnology

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ABSTRACT

Of the total number of nanotechnology related patents published in Australia, there has been a steady increase since 2004 in the percentage of patents resulting from Australian research. This trend is likely to continue in view of the recent increases in government funding for nanotechnology research. The effective design of research projects will be important to maximise the likelihood of successful commercialisation of intellectual property arising from that research. The nature of nanotechnology, as an emerging field with potential applications in a wide range of existing technologies, gives rise to special considerations for its effective protection and commercialisation.

While reliance upon trade secrets may be an adequate way of protecting some nanotech inventions, typically patent protection will be essential if the invention is to be licensed or sold. Given that nanotechnology often involves fundamental and significant advances, patentability may be relatively easy to establish. Assessing the patentability of a nanotech invention requires special considerations by virtue of its likely application in a diverse range of conventional technologies. Conversely, the high number of existing patents covering fundamental research in nanotechnology means researchers need to take care that they do not infringe other's patent rights when conducting their research or commercialising their research outcomes. Licensing of Nanotech patents may extend to fields other than of interest to the licensor.

1 INTRODUCTION

Research scientists would no doubt be aware that much, if not all, research being conducted today in Materials Science ultimately has commercialization as the desired outcome. For researchers working at universities or other government research organizations, while the commercialization will typically be done through an existing or potential commercial partner, it is still necessary for them to consider commercialization issues when starting off down the research track so that valuable time and research dollars are not wasted.

The relatively new field of nanotechnology, which has a major application to Materials Science, gives rise to special considerations for the protection and commercialization of research.

2 NANOTECH PATENTS ARISING FROM AUSTRALIAN RESEARCH

Figure 2.1 shows the total number of patents or patent applications relating to nanotechnology published in Australia per year since the start of the current century.

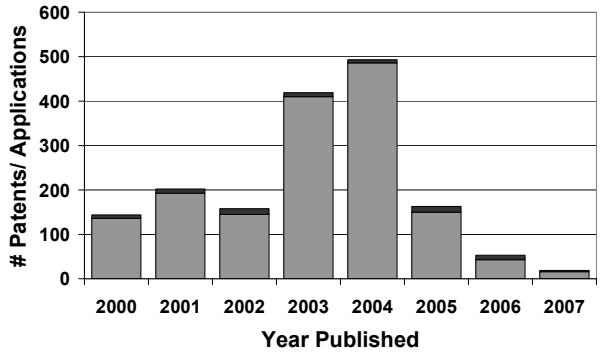

Figure 2.1

Grey represents the number of patents derived from overseas research and black represents the number of patents arising from Australian research. There has clearly been a significant reduction in the total number of nanotech patents published in Australia since the peak in 2004.

However, as is evident from Figure 2.2, of the total number of nanotech patents published in Australia, there has been a steady increase, from 2004 at least up to 2006, in the percentage of patents resulting from Australian research.

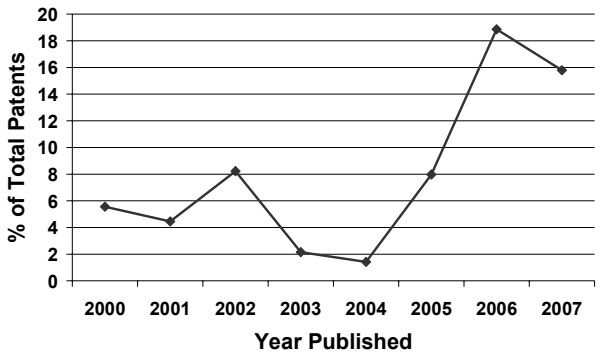

Figure 2.2

The figures so far for the first six months of 2007 suggest a subsequent decrease, but they are incomplete and it will be interesting to see if the trend continues over the rest of the year.

It should also be noted that these figures are likely to be an underestimate because there is a growing trend amongst Australian applicants to file their patent applications in USA in the first instance. It is also noteworthy that more than 50% of the patents arising from Australian research have been filed by public sector research organisations notably CSIRO and universities.

So, clearly, there has been a steady growth in the amount of patentable nanotech research outcomes from the main research organisations in Australia. We should expect this growth to continue, given increased government funding, such as the recently announced ARC grants for nanotechnology research at Monash University and the newly established CSIRO flagship "Niche Manufacturing". Getting the fundamentals of any research programme right is therefore important in order to maximise the chances of successful commercialisation of that research.

3 DESIGN OF NANOTECHNOLOGY RESEARCH PROJECTS

When designing a new research project, one of the fundamental questions which need to be asked is: has this research been done before? From a commercialization perspective, this is important for two reasons: Firstly, to ascertain the chances of the research resulting in something new and useful that could be protected and possibly licensed. Secondly, to be aware of any existing third party rights that might be infringed if the research is eventually commercialized.

In order to answer this question, searches of the patent literature need to be undertaken. "Patent Landscape" searches can provide information on previous work done in the field (the so-called "prior art") and "Freedom to Operate" searches can indicate whether commercialisation is likely to infringe other's rights.

3.1 Prior Art Searching

With the total number of patents worldwide numbering in the tens of millions, every patent is classified according to its subject matter in order to facilitate searching. The international patent classification system has unfortunately not kept pace with the nanotechnology revolution and there is as yet no class dedicated to nanotechnology inventions (although USA has recently introduced a cross reference system for US patents only). This can be problematic, because a particular nanotech invention can have potential applications in a diverse range of conventional technologies, and it can therefore be difficult to ensure that all relevant patent records will be located and considered in a search.

As an illustration, the many applications of carbon nanotubes that have been discovered since they were first invented include: electronics, hydrogen storage, composite materials, drug delivery and medical implants[1]. All of these applications are classified in quite diverse international patent classes. So, for example, a researcher working on improvements to manufacturing carbon nanotubes would need to undertake searches of the international patent classes relating to all the technologies to which the invention may potentially have application and not just the one of particular interest. Given that there have been thousands of patents filed in the nanotechnology area, this may indeed be a formidable task. So, ideally, the researcher should have an appreciation of the potential application of a particular nanotech invention to other technologies.

3.2 Patented Fundamental Research

Another complicating factor is that unlike other technical revolutions, like biotechnology or computers, a lot of the fundamental research in nanotechnology has been patented in quite broad patents[2], rather than being free to use in the public domain.

A principle reason for this is that universities and other government research organisations which generally tend to do the fundamental research have a far greater interest in patents nowadays than they used to. For example, Universities own fundamental patents for metal oxide nanorods, semiconducting nanocrystals, and light emitting nanocrystals[2]. In the

case of carbon nanotubes, NEC Corporation and IBM own very broad patents for single wall carbon nanotubes and they have asserted their rights against other companies who wish to manufacture or sell carbon nanotubes[3].

Researchers working in nanotechnology therefore need to be especially aware of any earlier broad patents and the risk of infringement of them by commercializing the results of their research.

3.3 Researching Patented Inventions

A further concern for nanotechnology researchers is whether merely conducting research on those earlier broad patents might nevertheless constitute infringement of them.

Researchers in Australia have long assumed that their unlicensed use of a patent in the ordinary course of research, called "experimental use", does not constitute patent infringement. However, the reality is that this assumption has no explicit support in patent law, nor has it been confirmed by the Australian courts.

There are many legitimate reasons for wanting to conduct research on a patented invention. One important reason is to better understand the invention in order to provide a platform for further patentable research and development.
Other reasons are to test the validity of the patent's claims or to ascertain whether the invention is adequately described to enable its reproduction.

Uncertainty as to whether experimental use might constitute patent infringement is thus of major concern, potentially exposing the Australian research community to litigation. This is particularly an issue where there are broad patents covering fundamental research, as is the case in nanotechnology, and the owners of those patents have been announcing their intention to exercise their rights, as .

A recent report[4] commissioned by the Federal Government recommends clarifying the law by introducing an explicit "experimental use exemption" to patent infringement. The Government's response to the report is expected shortly.

4 PROTECTING RESEARCH OUTCOME

Assuming that the investigations of the patent literature have given the all clear and the research project results in an invention having commercial potential, a decision will need to be made about how to protect the invention to stop others from unauthorised use of it. There are typically two alternatives: relying on keeping the invention as a trade secret, or filing a patent application.

In some circumstances, reliance on trade secrets may provide adequate protection[5], depending on whether the invention can be reverse-engineered and how "leak-proof" is the organization that owns the invention.

However, as noted earlier, many researchers may not be in a position to commercialise their research outcomes directly, and will instead rely on a commercial partner, whether existing or potential, to do so. In that case, it is highly recommended to protect the invention by a patent rather than simply relying on keeping the invention as a Trade Secret. A patent will typically be essential if one wishes to sell or licence the invention.

Given that Nanotechnology is still a relatively new and emerging field, often involving fundamental and significant advances, patentability of nanotech inventions may therefore be relatively easy to establish, especially where there are big differences between an invention and what was previously known. Nanotech inventions often reside in the scaling down of a known item or composition to the nano-level which can result in different properties not seen at larger scale[1]. If those properties have practical advantages, then it is likely that there is an inventive step. For example, by reducing the particle size of zinc oxide in a UV resistant coating composition to nanoscale dimensions, the transparency of the coating was improved, and there have been many patents relating to this technology.

5 LICENSING NANOTECH PATENTS

Once having obtained a patent, licensing is a common way of patentees to extract value from their research outcomes. This is particularly true for universities and government research organisations given that they are usually not in a position to commercialise their patents themselves.

In the case of a patent for a nanotechnology related invention, it should be kept in mind that it may have applications in technological areas other than that of interest to one's commercial partner, thereby providing further licencing opportunities. For example, advances in carbon nanotube technology may have application in products which take advantage of the carbon nanotubes' electrical conductivity (eg electronic products) or improved strength (eg sporting goods). Another example is the

nanoscale gold caps developed by UTS[6] which have potential application to solar glazing or to cancer treatment. In these situations a patentee may be able to negotiate additional licence agreements with companies working in those other technological areas not of interest to its commercial partner, and thereby extract further value from its patent.

Another issue which need to be considered when licensing nanotechnology patents is the type of licence. Exclusive licences are granted by patentees who do not intend to commercialise the invention themselves and are often granted by universities or government research organisations. Exclusive licences are clearly the most attractive to potential licensees and a licensor may negotiate higher licensing royalties by granting an exclusive licence.

An exclusive licence can be granted for a particular technological area, leaving the patentee able to negotiate further "exclusive" licenses for other technological areas.

5 REFERENCES

1. Wilson, M., Kannangara, K., Smith, G., Simmons, M., and Raguse, B., *Nanotechnology: Basic Science and Emerging Technologies,* UNSW Press, Sydney, 2002.
2. Lemley, Mark A., Patenting Nanotechnology, Stanford Law School, John M Olin Program in Law and Economics Working Paper No 304.
3. NEC Concludes First Carbon Nanotube Patent License Agreement in U.S. with SouthWest NanoTechnologies, Inc http://www.nanotechwire.com/news.asp?nid=3588
4. Advisory Council on Intellectual Property Report : Patents and Experimental Use, October 2005.
5. Halluin, A. P., Westin, L. P., Nanotechnology: The Importance of Intellectual Property Rights in an Emerging Technology.
6. Liu, J., and Cortie, M., Nanoscale Metal Caps and Their Unusual Properties, *Materials Australia,* Vol 38-4, pp 14-15.