

## The Nanotechnology Revolution

WIGGIN AND DANA

*Counsellors at Law*

The Wiggin and Dana INTELLECTUAL PROPERTY ADVISORY is a periodic newsletter designed to inform clients and others about recent developments in the field of intellectual property law. Nothing in the INTELLECTUAL PROPERTY ADVISORY constitutes legal advice, which can only be obtained as a result of personal consultation with an attorney. The information published here is believed to be accurate at the time of publication, but is subject to change and does not purport to be a complete statement of all relevant issues. If you have any requests for topics or other suggestions, please contact Advisory editor Mark W. Heaphy 203.498.4356, mheaphy@wiggin.com.

In the world of science, the latest buzzword is "nanotechnology". Nanotechnology and related "nano" subjects, such as nanoscience, nanostructures, nanobusiness, nanocomposites, and the like, have been the topic of everything from tradeshow and technical papers to Michael Crichton's latest science-fiction bestseller. All this publicity leads many to ask: What is nanotechnology?

Nanotechnology is, in general, any technology involving the characterization and manipulation of matter at the atomic and molecular level. This level has been described to include molecules and structures (nanostructures) having at least one dimension between roughly 1 and 100 nanometers, where a nanometer is one billionth of a meter.

To get a sense of the nano scale:

- a human hair measures 50,000 nanometers in width;
- the smallest thing seeable with the unaided human eye is 10,000 nanometers across;
- 10 hydrogen atoms in a line make up one nanometer; and
- the size difference between a nanometer and a person is roughly the same as the size difference between a person and the orbit of the moon.

Nanostructures aren't just small, they're the smallest structures possible to make. Of course, this definition of nanotechnology does little to explain the surrounding hype. To understand the importance of nanotechnology, one must look to the implications of characterizing and manipulating matter at the nano scale.

For hundreds of years, scientists have documented the chemical, electrical, and physical properties of matter. These physical properties include, for example, color, melting point, conductivity, and hardness. At bulk scales (*i.e.*, scales bigger than the nano scale), these properties are independent of size, and have been used in designing the tallest skyscraper to the smallest microchip. At the nano scale, however, the most fundamental properties of materials and structures depend on their size in a way they don't at any other scale. For example, a gold nanoparticle may be orange, purple, red, or green in color depending on its size. In another example, a nano scale wire or circuit component does not necessarily obey Ohm's law (the relationship between electrical current, voltage, and resistance upon which electronic design is based). Characterizing the physical properties and relationships of matter at the nano scale represents a new frontier of discovery for biologists, chemists, materials scientists, and engineers of all disciplines.

Today, scientists are not only beginning to understand the properties of matter on the nano scale, but are developing ways to manipulate this matter to create designer materials with properties of their choosing. It is the ability to manipulate individual molecules and atoms to create and improve materials and devices that has led some experts to identify nanotechnology as the potential Industrial Revolution of the 21<sup>st</sup> Century.

One promising nanomaterial, known as carbon nanotubes, has been found to have amazing mechanical and electrical properties. Carbon nanotubes are comprised of

*Continued on page 4*

# The Madrid Protocol

---

On November 2, 2003, the United States joined the international trademark treaty known as the Madrid Protocol. The Protocol provides U.S. trademark owners with the ability to seek registration in Madrid Protocol countries, using what has been called a "one-stop" filing mechanism. The system, administered by WIPO, offers the owner of a mark in the United States the ability to obtain registration (called an "International Registration") for its mark(s) in a vast number of countries by using a centralized filing system. A single application is filed with the United States Patent and Trademark Office, designating those Member Countries in which the applicant wishes to seek registration. Currently there are 58 countries (also referred to as "member states") that are party to the Protocol. In addition to providing U.S. owners with the ability to seek international registration for their marks, U.S. adherence to the Protocol allows applicants from foreign countries to seek U.S. registration in the same manner.

The Protocol facilitates filing in Member Countries, through use of a single application in one Trademark Office, with one set of documents, in a single language, with payment of a single filing fee (that is payable in U.S. currency), and results in a single registration, with one registration number that has one renewal date. Because the filing system is "centralized" through one Trademark Office, eliminating the need to retain lawyers in all foreign countries where registration is desired, this centralized filing greatly reduces the cost of obtaining worldwide trademark protection for U.S. registrants, businesses and individuals alike. With the exception of the European Union (Community), where it is now possible to obtain a single registration covering all 15 member states of the European Union (note: the European Union is in the process of being enlarged, and the European Union is ultimately expected to become a contracting party to the Protocol), and certain African countries, it is not currently possible to obtain registration in numerous foreign

countries without filing separate applications in each of those countries. In addition to reductions in filing fees, maintenance fees and lawyer/agents' fees, changes of address, assignments and similar changes (*e.g.*, name changes) only need to be filed in one office, and only require payment of a single filing fee. Also, under the Protocol, the owner of an International Registration may subsequently extend an existing International Registration to additional Member Countries, including countries that may later join the Protocol.

When an International Application is filed in the applicant's home country "Office of Origin" (in the United States, the United States Patent and Trademark Office), the applicant designates those Member Countries for which coverage is sought. If an International Application is filed within six-months of a corresponding filing in an applicant's country of origin, it is possible to claim the filing date priority of the "home country" application. Once filed, the U.S. Patent and Trademark Office "certifies" that the mark, the owner and the goods and/or services in the International Application are the same as those listed in the basic registration or application. The U.S. Patent and Trademark Office then forwards the International application to WIPO. To receive a "Date of Receipt" (a filing date) from WIPO, the International Application must be filed through the U.S. Patent and Trademark Office's electronic "TEAS" system, if the application is being filed by a U.S. applicant, and, in any event, must contain the following elements:

- Basic application and its filing date or registration number and registration date
- Name and address of the international applicant (identical to basic application)
- Drawing of the mark
- Color claim (if appropriate)
- Description of the mark (if appropriate)
- Type of mark (*e.g.*, sound, three-dimensional, etc., if appropriate)

- List of Designated Countries
- Certification fee (if filed through U.S. Patent and Trademark Office) and WIPO International Application fees for all classes and designated countries
- Correspondence e-mail address

After these filing requirements are met, each country designated by the applicant conducts its own examination. If a country refuses registration, the applicant responds directly to the refusing country's trademark office, not to either the U.S. Patent and Trademark Office or WIPO. If the applicant can not overcome a refusal in a particular designated country, or if the applicant decides not to respond to the refusal, the International Registration still issues, however, the coverage is not extended to the country that refused registration.

For the first five years of registration, an International Registration is dependent on the continued validity of the underlying Basic Registration or Application. If the corresponding Basic Registration or Application is invalidated for any reason during the initial five-year period of International Registration, the International Registration is likewise invalidated. In this situation, however, the International Registration can be converted into separate national filings in the designated countries, retaining the filing date (including priority filing date) of the Basic Registration or Application, provided a "Request for Transformation" is filed within three months of the invalidation of the underlying International Registration, and upon payment of the national filing fee in each country.

International Registrations are effective for a ten-year period and renewable for similar periods, upon the filing of a single Renewal Application accompanied by the appropriate renewal fee. International Registrations enjoy the same rights and enforceability as a registration that results from a "direct" national filing. Accordingly while not

## Erroneous Small Entity Designation Can Jeopardize Patent Rights

A decision of the Court of Appeals for the Federal Circuit (CAFC) in *Ulead Systems, Inc. v. Lex Computer Management Corp.*, 351 F.3d 1120 (Fed. Cir. December 9, 2003), highlights the importance of carefully determining whether a patent applicant or patentee is qualified for "small entity" status when paying fees to the U.S. Patent and Trademark Office (PTO).

The PTO rules define a "small entity" as an independent inventor, a non-profit organization, or a "small business concern." A "small business concern" is any business concern that, together with its affiliates, has no more than 500 employees and that has not assigned, granted, conveyed or licensed, and is not obligated to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor or to any concern that would not qualify as a small business concern or a nonprofit organization. Being classified as a small entity entitles the patent applicant or patentee to pay 50% of the standard fees for application filing and maintenance charges.

In this case, the defendant Lex never had more than 20 employees and qualified as a small entity when it acquired the subject patent and paid the first maintenance fee at the reduced rate. However, Lex later granted at least 3 non-exclusive licenses to companies that each had more than 500 employees, after which Lex continued to pay the maintenance fees on the patent at the reduced small entity rates.

Ulead filed a declaratory judgment action in district court alleging that Lex's patent was unenforceable, invalid, and/or expired. Ulead claimed that the patent was unenforceable and/or invalid because of Lex's misrepresentation of its small entity status to the PTO, and that the patent had expired because Lex had failed to pay the correct maintenance fees and did not pay the incorrect small entity fee in "good faith" as required by PTO regulations. Lex

acknowledged that it was not entitled to claim small entity status at the time it paid its second and third maintenance fees, and immediately petitioned the PTO to accept the balance of the deficiency owed on the maintenance fees. The PTO granted that petition and accepted payment. Lex then opposed Ulead's action on the grounds that it did not intend to mislead the PTO when it claimed small entity status, and that the patent was not expired because the PTO had properly excused its erroneous claim to small entity status and underpayment of fees.

The district court held that the patent was unenforceable because Lex had committed "inequitable conduct" in misrepresenting its small entity status and that it had intent to deceive the PTO. The district court also held that the patent had expired due to Lex's failure to pay the full maintenance fees. Lex appealed to the CAFC.

The CAFC began its analysis by reviewing the elements of inequitable conduct that renders a patent unenforceable. According to the court, inequitable conduct arises, "when there is evidence of affirmative misrepresentation of a material fact, failure to disclose material information, or submission of false material information, coupled with an intent to deceive." Although historically issues of unenforceability have arisen in cases involving inequitable conduct occurring during the prosecution of a patent, the Court saw "no reason why the doctrine should not extend into other contexts, like the present one, where the allegation is that inequitable conduct has occurred after the patent has issued and during the course of establishing and paying the appropriate maintenance fee."

The Court concluded that Lex's misrepresentation of its small entity status was material to the PTO's acceptance of reduced maintenance fees and, by extension, survival of the patent. The Court also found that although Lex admitted that it was not enti-

tled to small entity status when it filed its affidavit of small entity status and paid reduced fees, these were innocent errors, that it was grossly negligent at worst, and that it did not have an intent to deceive the PTO.

With respect to Ulead's assertion that Lex's patent had expired for Lex's failure to pay the proper maintenance fee, the Court stated "the question here is whether Lex committed inequitable conduct by knowingly misrepresenting that it was entitled to have the error excused." The Court added that "if the patentee makes a request to correct incorrect payment of fees as a small entity knowing that it does not satisfy the good faith error standard ... the patentee may be found to have engaged in inequitable conduct." The Court concluded that the issue of whether Lex's patent was expired for failure to pay the proper maintenance fee should be resolved by the district court, especially on the issue of intent as it relates to whether Lex acted in bad faith when it initially asserted small entity status.

As the Ulead decision makes clear, if at any time small entity status is to be claimed, the patentee or patent applicant must first conduct a thorough investigation into whether claiming such status is appropriate. Failure to conduct such an investigation before making any claim for small entity status could form the basis of an inequitable conduct claim if the patent assets are challenged in court. In all cases (individual, nonprofit, or small business), the patentee or patent applicant must investigate whether there has been, or is an obligation to make, an assignment, grant, conveyance, or license of the patent assets in question to a person or entity that is not an individual, nonprofit, or small business as defined by the PTO.

Accordingly, a patentee or patent applicant should report to its patent attorney any transactions involving the licensing, conveyance, granting, or assignment of patent assets, so the attorney can take appropriate steps to review the transaction and determine if small

---

## The Nanotechnology Revolution

*Continued from page 1*

individual carbon atoms that are linked together hexagonally and rolled into tubes. While estimates vary, the tensile strength of a carbon nanotube is said to be in excess of 60 times stronger than high-grade steel. By some estimates, a nanotube fiber narrower than a human hair might be able to suspend thousands of pounds, though no one has yet been able to make a tube big enough to find out for sure. Although carbon nanotube manufacture is still in its infancy, visionaries foresee the use of carbon nanotubes in the construction of everything from automobile bridges to a cable for a "space elevator" that would transport cargo between the earth and a satellite. In the nearer future, it is likely that carbon nanotubes will be used in composite materials for tennis rackets, golf clubs, and skis.

In addition to their amazing mechanical properties, carbon nanotubes have also been found to have amazing electrical properties. When rolled in one configuration, carbon nanotubes have been found to act almost like a superconductor, transmitting electricity with virtually no resistance. When rolled in another configuration, carbon nanotubes have been found to act like a semiconductor. These two properties are ideal for the manufacture of microchips, and companies have already used nanotubes to create usable transistors and logic gates.

Nanotechnology promises to yield materials and systems with superior electrical, chemical, mechanical, or optical properties with the potential for widespread uses in many industries, including electronics and information technology, healthcare, defense and aerospace. Nanotechnology may also one day enable the detection of disease on the cellular level and the targeting of treatment only to tissues where it is needed in a patient's body.

The National Science Foundation predicts that nano-related goods and services could be a \$1 trillion market by 2015. Technology companies and major universities throughout the world have identified nanotechnology as a priority, and on December 3, 2003, President Bush signed into law the 21<sup>st</sup> Century Nanotechnology Research and Development Act, which appropriates nearly \$4 billion for nanotechnology research and development over the next four years.

Nanotechnology is more than just technology on a small scale. It is a new frontier of scientific study, and is poised to be the next big technological advancement.

*For further information contact*  
Tim Olson 860.297.3709  
tolson@wiggin.com

---

## Erroneous Small Entity Designation Can Jeopardize Patent Rights

*Continued from page 3*

entity status should be changed. Further, with respect to small business concerns, the patentee or applicant should thoroughly investigate all affiliate relationships, including investor relationships and obligations. Importantly, the issue of whether claiming small entity status is proper must be continuously reviewed and any change in status promptly disclosed to the PTO. If the applicant or patentee makes an improper attempt to claim small entity status with the intent to deceive, the PTO will regard that attempt as fraud, and expose the applicant or patentee to a variety of sanctions as well as placing the enforceability of the patent in jeopardy.

*For further information contact*  
Todd Garabedian 860.297.3716  
tgarabedian@wiggin.com

---

## The Madrid Protocol

*Continued from page 2*

appropriate in every situation, the Madrid Protocol can provide an effective vehicle for obtaining and maintaining registration for marks in a number of foreign countries in a more streamlined, cost effective manner. Recognition of both the benefits and the limitations of the Madrid Protocol are, however, imperative to implementation of a sound strategy for developing and maintaining a trademark portfolio.

*For further information contact*  
Francis Duffin 203.498.4347  
fduffin@wiggin.com

---

One Century Tower  
P.O. Box 1832  
New Haven CT  
06508-1832  
Telephone 203.498.4400  
Telefax 203.782.2889

400 Atlantic Street  
P.O. Box 110325  
Stamford CT  
06911-0325  
Telephone 203.363.7600  
Telefax 203.363.7676

450 Lexington Avenue  
Suite 3800  
New York NY  
10017-3913  
Telephone 212.490.1700  
Telefax 212.490.0536

One CityPlace  
185 Asylum Street  
Hartford CT  
06103-3402  
Telephone 860.297.3700  
Telefax 860.525.9380

Quaker Park  
1001 Hector Street, Ste. 240  
Conshohocken PA  
19428-2395  
Telephone 610.834.2400  
Telefax 610.834.3055