II. Patentable Subject Matter

The European Patent Convention[7] (EPC) defines four main requisites to grant a patent for an invention. These basic requisites establish that the invention (i) is not explicitly excluded from patentability, (ii) is new, (iii) involves an inventive step and (iv) is susceptible of industrial application.[8]

Before analyzing the application of patentability requirements to nanomaterials, we will make some clarifications on the distinctiveness of nanotechnology and its development originated from scientific discoveries or nanoscience. This differentiation will serve as introduction to the discussion on patentable subject matter, specifically on the patentability of discoveries and basic laws of science, which are much related to the advance of nanotechnology.

1. Nanoscience v. nanotechnology

Basic research and science has been historically related to the discovery of natural phenomenon and the analysis of how matter, organisms or laws of science work and interact among them. The understanding of these basic principles and the analysis of natural elements have then inspired researchers to build upon new developments by the application of that knowledge. While the activities related to the understanding of the rules and laws governing materials and processes are in general considered as basic research activities, the application of that knowledge into tangible and usable results and the generation of technology is typically identified as applied science or technology development[9]. In this way, applied science involves the intention to solve a real problem, many times by using the knowledge generated by the basic research.[10]

7 Convention on the Grant of European Patents (European Patent Convention), 13th Edition, entered into force in December 2007, available at http://www.epo.org/patents/law/legal-texts/html/epc/2000/e/contents.html (last visited September, 2009).

8 EPC, Chapter I, Patentability, Articles 52, 53, 54, 56 and 57.

9 For a discussion of this and other definitions of basic research, *see* Jane Calvert and Ben R. Martin, *Changing Conceptions of Basic Research?*, Science and Technology Policy Research, University of Sussex, 2001. Available at http://www.oecd.org/dataoecd/39/0/2674369.pdf (last visited August, 2009)

10 *See*, Hans Poser, *On Structural Differences Between Science and Engineering*, PHIL & TECH 4:2, 1998.

Nanotechnology has an intimate relationship with basic science.[11] Many inventions available today would not be possible without the pioneers that understood and explained the basic laws of physic and chemistry that after some time were applied to develop inventions.[12] In this way, much of the knowledge coming from these areas is responsible for the later development of nanotechnology and the generation of patentable inventions.[13] The concept can be illustrated with an example, the case of Albert Fert from the Université Paris-Sud, France and Peter Grünberg, from the Institut für Festkörperforschung, Germany, two researchers who won the Nobel Prize in physics in 2007 for their discovery of giant magnetoresistance during the 90's.[14] Giant magnetoresistance is the occurrence of a high change in electrical resistance of a material when immersed in a weak magnetic field.[15] This completely new phenomenon discovered by the two scientists generated a world of inventions in the field of electronics, particularly in the design of nanostructures to be used, for example, in the improvement of hard drive reader heads.[16] It was a few years after the discovery of the phenomenon that IBM started to use and patent the application of this new principle of physics in useful inventions.[17]

Given that nanotechnology and nanoscience are so closely related and that basic research is so important — more so than for other fields — to allow further development in the field, we would expect to find provisions in the patent system oriented to allow the generators of this knowledge to enjoy exclusivity with regard to their developments. If this were the case, inventors involved in basic research would be allowed to get exclusivity on the results generated by their work. Nevertheless, some of these creations are explicitly, or in other ways, excluded from patentability.

11 D. R. Basset, *Nanoscience and nanotechnology: an overview*, Center for Workforce Development, University of Washington, 2006.

12 *Id.*

13 *Id.*

14 Press release, The Royal Swedish Academy of Sciences, December 2007. Available at http://nobelprize.org/nobel_prizes/physics/laureates/2007/press.html (last visited May, 2009).

15 G. Binasch, P. Grünberg, F. Saurenbach, and W. Zinn, *Enhanced magnetoresistance in layered magnetic structures with antiferromagnetic interlayer exchange*, Phys. Rev. B 39, 4828, 1989.

16 *See*, T. Yoshida et al., Magnetoresistance effect of InAs deep quantum well structures grown on GaAs substrates by molecular beam epitaxy, 1997 International Conference on Solid-state Sensors and Actuators, Chicago, June 16-79, 1997.

17 *See,* for example, Dill, Frederick Hayes et al., US Patent 5,898,548, *Shielded magnetic tunnel junction magnetoresistive read head*, issued on 1997.

In the next section these provisions will be evaluated to show how they may impact on the protection of nanotechnology and if the patent system, as it is defined today, promotes researchers and institutions entering into challenging projects related to basic science in the field of nanotechnology. These questions will be approached by analyzing the rules of the current system for examples of instances where basic research is essential to develop uses and applied solutions from nanotechnology.

2. Inventions and discoveries

Basic research is defined as the investigation conducted with the main purpose of discovering new issues or to develop theories about natural phenomenon.[18] The knowledge generated by this activity is in many cases non-patentable, either because it is simply excluded as patentable subject matter or because it fails to fulfill the other basic patentability requirements.

Article 52 of the EPC states that a patentable invention includes "[…] any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application."[19] The Convention doesn't define what an invention is, nevertheless it provides a non-exhaustive list with examples of what doesn't constitute an invention.[20] According to this provision, discoveries and scientific theories are not considered inventions and therefore excluded from patentability.[21] While EPC is clear on the point that a discovery is not patentable, it is silent on the definition of discovery. In this regard, the European Patent Office (EPO) has provided some clarification on what constitutes an invention under Article 52(2), but it has not provided any formal definition for the word *discovery*, obliging a case by case analysis in order to asses the requirement with regard to each particular technology.[22]

It appears that EPO has not dealt in depth with the clarification of a general definition seems to be because patentability concerns in connection with discoveries were approached from different perspectives. This may be due to the difficulty associated with providing a general rule on the understanding of the meaning of *discovery*. These alternative approaches have centered on the development of the

18 Merriam-Webster Online Dictionary. http://www.merriam-webster.com/dictionary/research (last visited May, 2009)

19 EPC, Article 52, Patentable Inventions.

20 *Id.* at (2).

21 *Id.* at (2)(a).

22 *See*, for example, V 0008/94.