important points in the history of polymers' science and industrialization shows the difference between this area of the sciences and technologies of materials and the NST in terms of age, development, industrial importance.

4. THEORETICAL BACKGROUND: THE RELATIONS BETWEEN SCIENCE AND INNOVATION AND BETWEEN PATENTS AND SCIENTIFIC ARTICLES

The influence of scientific discoveries on industrial innovation and the speed and paths of this influence have been widely investigated along years. Colyvas *et al.* (2004) describe the exploitation of university inventions via a series of case studies. Results show that Intellectual Property Rights result in being more important for embryonic inventions rather than for those ones ready for exploitation, while the action of Technology Transfer offices is most important for those technological areas where the links with industries are weaker.

The patent-journal article relations have been widely studied. Albert *et al.* (1991) analyzing a set of industrial patents issued by the same company show that highly cited patents are of significantly greater technological value than those that are less cited or not cited at all. The basic idea behind the work is in fact that a highly cited U.S. patent has been "prior art" for several other ones and thus contains significant advances.

Schmoch (1993) describes the science-technology relation on a quantitative basis. He distinguishes the different types of citations in EPO procedures assessing the different type of linkage to the patent, which is not necessarily strong, and the different causes a non-patent citation is made. His analysis of non-patent citations in patents did not reveal clear results under the point of view of assessing new R&D management tools, but according to his statements "there exists plausible support for the hypothesis that a high number of non-patent citations can be considered as an indicator for a strong science interface".

The analysis performed by Narin (1994) on patent productivity and citations shows the closeness between science and technology in several areas, the tendency to prefer within-country citations and the fact that patents and journal articles show many similarities under the bibliometric aspect.

In a further work (Narin *et al.*, 1995) he and his co-authors, again using science references in patents, infer the growing link between science and technology in the U.S., and the role of driving force of public science towards high technology. Analyzing non-patent references in patents again Narin *et al.* (1997) show again a steady increase in science linkage, a marked intra-national effect (also present in article-to-article and patent-to-patent citations) and the fact that U.S. industry has a wide science base and that public science plays an essential role in its supporting.

Meyer (2000) first accurately studies the structure of a patent, the role of citations and their different types following Schmoch (1993), describing then 10 case studies in order to assess science links, the direction of the flow of knowledge and possible national differences. Results show the general science-technology connection but the fact that citations hardly represent a direct link between cited journal article and citing patent (thus criticizing the use of citations made by Narin). Scientific findings represent an important background for patents, but links established by citations have a mediated character. Nevertheless, patent citations of scientific references can indicate the intensity of science – technology interrelation, albeit indirectly, for different fields; one should not make comparisons on the effectiveness of knowledge transfer amongst fields.

Again Meyer (2001) studies paper citations in nanoscience and nanotechnology patents. His database considers pieces of knowledge produced at the very beginning of the "nano revolution" (patents issued from 1976 to 1999, and journal articles written between 1991 and 1996) and thus he relies on a very small database. At that historical point evidences did support the idea that in the studied field science and technology were