Second SAAR-LOR-LUX Meeting on Advanced Materials and Nanocomposite Techniques

Extended Abstracts

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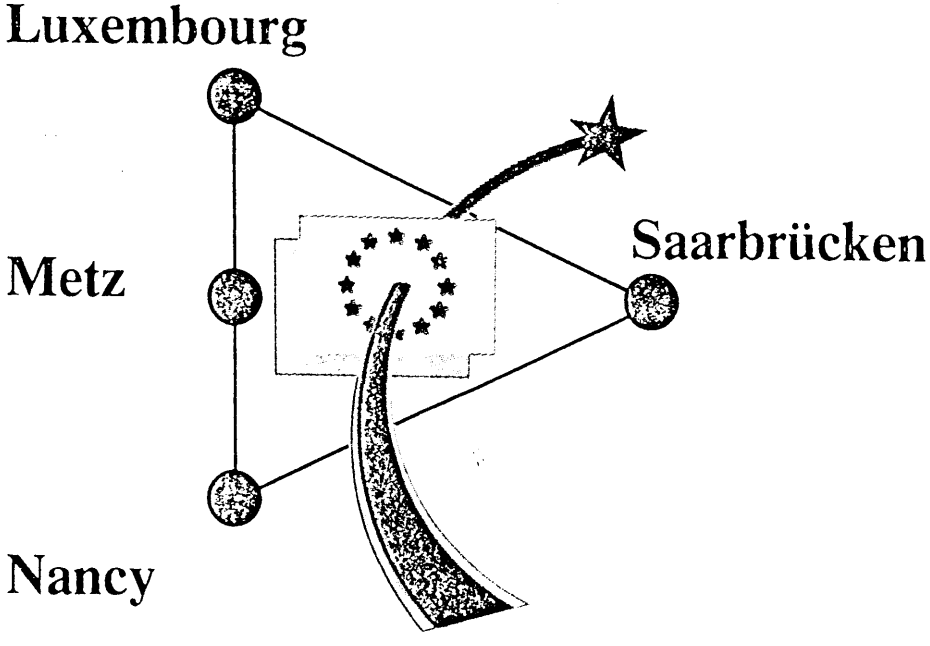

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ROLE OF NEW MATERIALS FOR INDUSTRIAL TECHNOLOGIES

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I. INTRODUCTION

Materials have always played an important role in human history. In the early times of human development, natural materials like rock, bones, wood or natural fibers from plants have been the only available materials. Later on, "synthetic" materials like glass or ceramics and metals have been fabricated. These materials have revolutionized human lifestyle and generated the basis for the industrial age. Typical for the most common materials was the fact that they had been used in relatively large quantities, since structural components (tools, machine parts etc.) had been fabricated. Within this chain, the material development and the market risk is run by the material producer only. Concerning the long development periods of advanced materials, this can only work efficiently if market volumes large enough can be envisaged. Deficiencies are built up with materials playing key roles for components and devices and which are required in small volumes only. In these cases, in general, market volumes for the pure material selling are not large enough to justify expensive long-term high risk developments. The integration of the user into the material development risk could solve major problems and prevent a drawback in advanced material supply, but is rather the exception. Institutional material research and development can play an important role, if the basic research can be focused on developments with application potential. For these reasons, it is necessary to define fields based on the needs of industry and to put the research on an interdisciplinary level based on a well organized cooperation between researchers (chemists, physicists, material scientists) and device makers.

II. RESEARCH STRATEGY

This integrated strategy is an indispensible prerequirement for creating sufficient technology transfer and to be highly innovative at the same time. At present, technology transfer in the material-oriented disciplines in the European countries, in general, is rather poor compared to the quality and quantity of these research directions. This creates a significant drawback in material-based important technologies, such as electronics, optics, information devices and a series of consumer goods related to this. In Fig. 1, a schematic is given showing the flow of information and interaction for realizing better technology transfer.

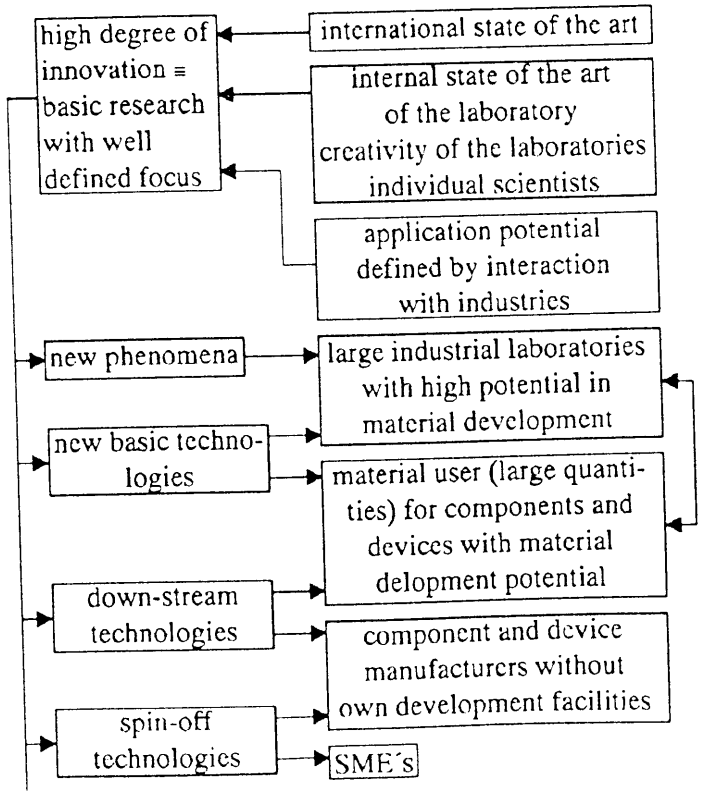

Fig. 1: Integrated conception for effective technology transfer from research to industry.

Due to the long time scales required for innovative material-based technologies, a balanced ratio between industrial projects and industry-independent research has to be established and no fixed ratio can be defined. For example, the MITI (Japan Ministry for International Trade and Industry) at present has established 16 national laboratories 100 % financed. These institutes are operating for a limited time (e. g. 10 years) on directions defined by MITI and are rearranged if new important themes emerge. The fields are defined by mechanisms shown in fig. 1. This research policy had a tremendous effect on Japanese material-based technologies.

In fig. 2, an example of our own work using a similar strategy is shown. It depicts the development of a moisture- and dust-repellent, transparent, scratch-resistant coating to be used for a variety of new material technologies.

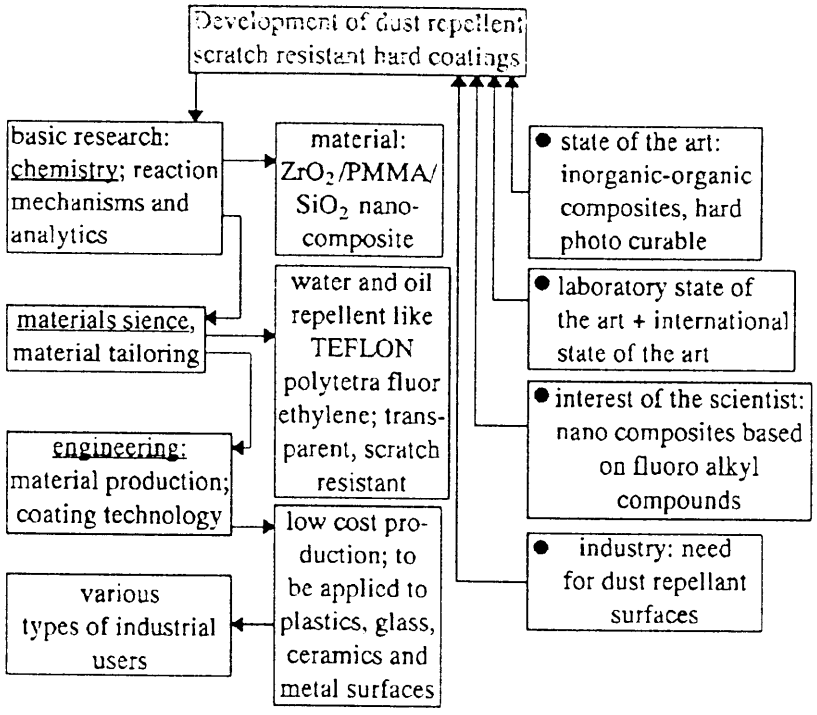

Fig. 2: Development of a dust repellent coating based on an inorganic-organic nanocomposite [after 1 - 3].

III. CONCLUSIONS

Summarizing, there is to say that the technology transfer from basic research to industrial technologies has to be improved. This cannot be achieved only by an increasing direct interaction between industry and existing research institutes, since this especially excludes important material users with low material development capacities and SMEs. The latter depend on an interdisciplinary downstream development; otherwise, they cannot take over research results. This fact is of high importance since device makers play the key role as users of advanced material technologies. In order to achieve this goal, more interdisciplinary research with focus on materials (not only basic phenomena) with application potential has to be established.

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