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MICROENCAPSULATION: APPLICATIONS, PATENTS AND TRENDS

Patents have a two–fold function in scientific research and development. As industrial intellectual property documents, patents provide legal protection of inventions. They are granting its holder the exclusive right to make use of an invention for a defined period of time and for a limited geographic area, and the right to stop others from making, using or selling the claimed invention without authorisation. In addition to their legal functions, patents are an indispensable source of literature in applied research and technology, bringing newest information on innovative developments. If monitored consistently, patents become effective means of avoiding parallel developments and duplication of research. Because of their innovative nature and the "no prior disclosure" conditions, patents bring information on new achievements before scientific articles, conference proceedings and monographs. Moreover, statistics show that over 70% of information in patents has never been published elsewhere (Devon and Kardo, 2001), and that more than 80% of all the technical knowledge in the world is published in patent literature (EPO, 2003). For this reason, comprehensive information studies should include both, analyses of non–patent scientific literature (indicating trends in basic research), and of patent documents (illustrating applied research and development). Patent bibliometrics and value–added bibliographic database processing can be applied to detect shifts in the innovation system, to point out dynamic innovation areas, and investigate prosperous fields. Microencapsulation is a typical example of a knowledge intensive dynamic research field, with a wide spectrum of industrial applications, and a rapid growth of publications (Arshady and Boh, 2003). The following contribution will present selected examples of using patent bibliometrics and value–added information methods for the recognition of trends in microencapsulation technologies and their applications.

MATERIAL AND METHODS

STN International (The Scientific and Technical Information Network) was used as a host for online database processing. In addition to online searching with full–featured service designed for professional information searchers through special telecommunication links (STN Classic), STN can be accessed on the Web (STN on the Web, 2004). A Search Preview tool was applied, enabling testing of search profiles in different databases, giving the number of hits per database. In addition, Espacenet, a patent database offered freely by the European Patent Office, was processed via Internet (EPO, 2003).

The methodology of value–added database processing (Kardo and Boh, 2000), based on functional information density, was used for processing of bibliographic/patent databases to predict and recognise trends in specific research and development domains. The method includes four main steps: (a) definition of a research field by a combination of key words (to define the specific research field), a time series (publication year), and other searchable parameters, such as document type, corporate source/patent assignee, location, language, etc.; (b) selection and processing of most appropriate databases for a given research problem, preparation of detailed search profiles; (c) statistical analysis of search results, which can be performed manually or automatically by specific commands, (d) graphic presentation of results for the recognition and interpretation of trends. Heuristic information methods, such as data structuring and recognition of patterns (Kornhauser and Boh, 1992) were used for analysis and synthesis of data from similar patent documents with numerous, scattered and fragmented information. These methods enable the recognition of research areas, application fields, families of products, and can facilitate the recognition of potential new products within the unoccupied/non–patented market niches, or the development/improvement of technological process backbones.

RESULTS AND DISCUSSION

Due to the rapid development of micro-encapsulation technologies and wide opportunities for their applications in different industrial branches, the amount of information in this field has been growing rapidly. In 2004, there were 27 international databases that were accessible online at STN International and

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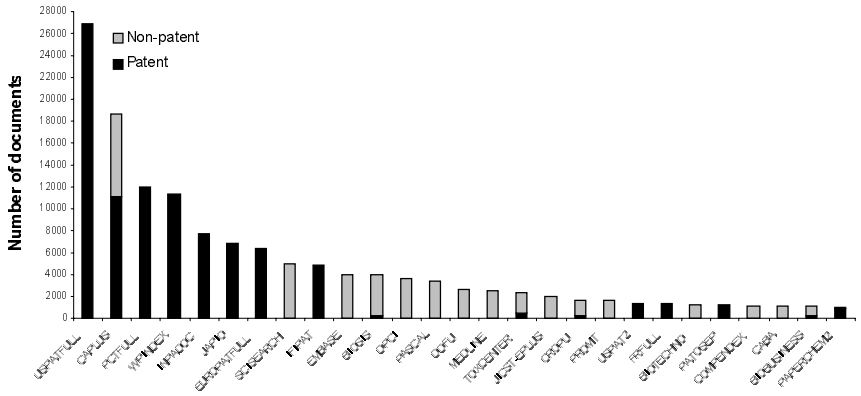

Figure 1. Bibliographic databases containing more than 1000 records on microencapsulation (STN International, database clusters: Chemistry, Bioscience, Patents; search profile microcapsul? or microencapsul?; processed May 2004.

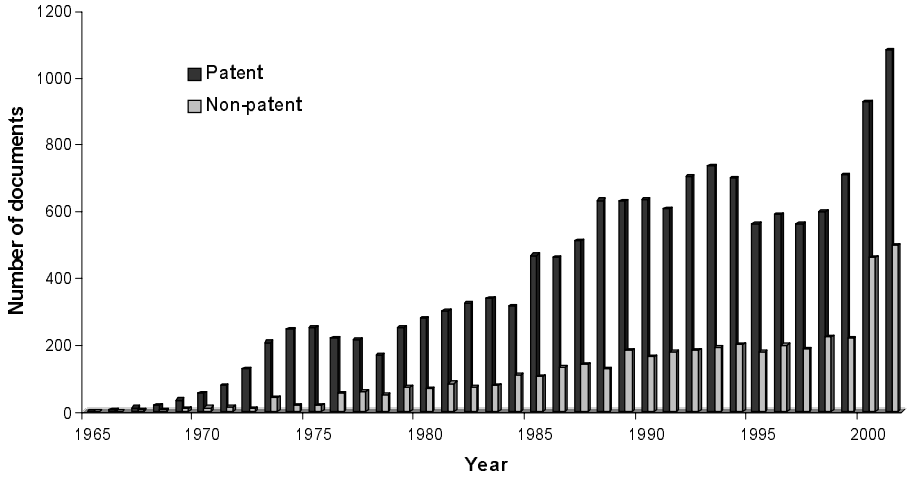

Figure 2. Rapid growth of new publications on microencapsulation in CAPlus database; search profile microcapsul? or microencapsul?; processed May 2004.

contained more than 1.000 records on micro-encapsulation (Figure 1). Four of them contained more than 10.000 records on microencapsulation – a bibliographic database CA Plus with patent and non–patent documents, and three patent databases: USPatfull, PCTFull, and The World Patents Index.

The ratio between patent and non–patent documents on microencapsulation in the CAPlus database within the years 1965 to 2003 was 11 million : 7.5 million, illustrating a prevailing role of applied and industrial research. Trends in patent vs. non–patent literature on microencapsulation in a time scale (Figure 2) illustrate a slow but constant growth of basic research (non–patent), while industrial research (patents) grew faster and was expressed in a pattern of cyclic waves of inventions).

Searches in Espacenet, a patent database containing more than 30 million records, revealed that in May 2004 there were more than 8 thousand patent applications on microencapsulation, and that the ratio between patent applications from United States, Japan and Europe was 2.5 US : 1.6 JP : 1.0 EP (Figure 3). There were at least 13 companies that held more than 20 patent applications on microencapsulation, with four applicants owning more than 100 – Fuji, Mead, Mitsubishi and Kanzaki, and Bayer closely approaching this number (Figure 4). Between European companies,

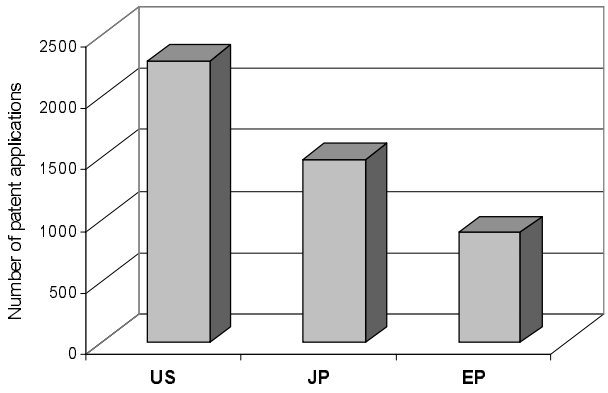

Figure 3. Ratio of US, Japanese and European patent applications on microencapsulation in the Espacenet patent database; Advanced Search – search profile: Keyword(s) in title or abstract: microcapsule or microcapsules or micro-encapsulation or microencapsulated, Application number: US (or JP, EP)

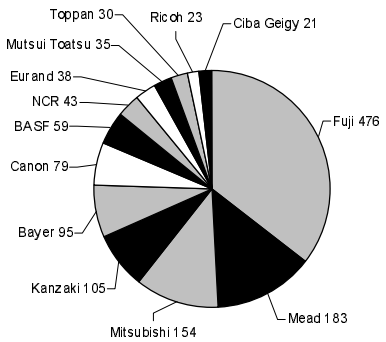

Figure 4. Patent applicants with more than 20 patents on microencapsulation in the Espacenet patent database; Advanced Search – search profile: Keyword(s) in title or abstract: microcapsule or microcapsules or microencapsulation or microencapsulated, Applicant: Fuji (applicant names)

Bayer, BASF, Eurand and Ciba Geigy own more than 20 patent applications on microencapsulation. However, these data have to be viewed as an illustration only, taking into account that Espacenet has been designed primarily for the general public. More reliable professional patent searches with complete and official data can only be done with online services offering professional/commercial patent databases (see Patents database cluster at STN on the Web).

Value–added processing of bibliographic databases provides the recognition of trends in a time scale, and comparisons of selected search parameters. For the recognition of specific technologies, products, and market niches, this is not sufficient, and primary documents have to be analysed. Figure 5 represents a segment of an information tree structure on microencapsulation applications fields and families of

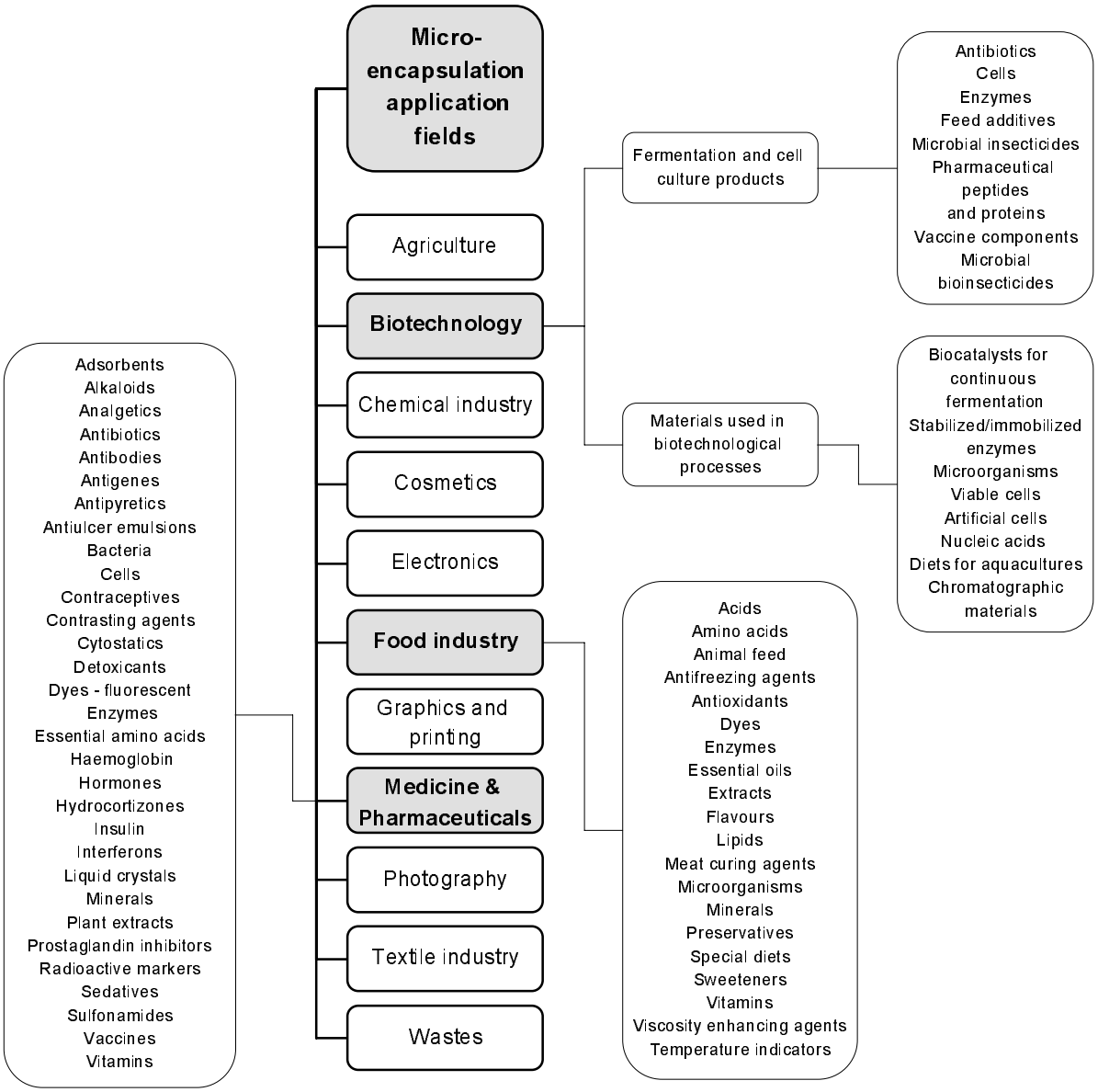

Figure 5. Examples of microencapsulation applications in different industrial branches

products, which was developed as a part of an in–house information system on microencapsulation, containing data extracted from about 9 thousand documents (Boh, 2001).

CONCLUSIONS

Microencapsulation is a typical multidisciplinary field with a rapid growth of information and a large proportion of patents. The success of research, development and marketing therefore depends to a large extent on the ability to analyse large amounts of scattered and fragmented information, and to transform it into knowledge. The skill of efficient analysing and using patent literature has become one of the prerequisites for the employability of university graduates and researchers, especially in pharmaceutical, biotechnological, chemical and similar companies, where industrial intellectual property rights play a crucial role in competitiveness and in early identification of prosperous market niches. Computerised databases and information methods provide a useful tool to fulfil this demanding task.

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