Combinatorial and High-Throughput Approaches in Polymer and Materials Science: Hype or Real Paradigm Shift?

The advent of combinatorial chemistry and high-throughput experimentation techniques have had a remarkable impact on the way research is conducted both in the pharmaceutical industry and in medicinal research. Even though combinatorial experimentation was not as successful as forecast in the early hype, the search for new biologically active compounds and drugs cannot be imagined anymore without the extensive utilization of combinatorial synthetic methods, ultra-fast screening technologies, and large libraries. These advances triggered a similar activity in materials research, starting with inorganic thin film libraries and catalysis. Over the last three years impressive developments have been observed in the application of combinatorial approaches to polymer science, where the pace of research is currently accelerating in a nearly exponential way. The number of academic groups and centers as well as the number of industrial labs involved is increasing rapidly (with more companies now able and willing to disclose their results), and international meetings and conferences with sessions related to combinatorial materials and polymer research take place nearly every month. This acceleration is also reflected in the number of contributions to the second Special Issue in this journal: they have increased from 15 to over 45 contributions.

Preparation of this volume was triggered by the success of the second Dutch Polymer Institute (DPI) workshop in Eindhoven (June 2003), where university groups, industrial researchers as well as software and leading equipment manufacturers discussed in detail combinatorial and high-throughput approaches in polymer research (see, e.g., *Macromol. Rapid Commun.* **2003**, *24*, 642). In parallel with the DPI developments covering polymerizations, library preparation, and data-mining and applications (14 industrial and academic partners, www.combimat.org), the NIST Combinatorial Methods Center, which is focused on the development of new measurement platforms for combinatorial and high-throughput materials science, is now in its third year with more than 20 industrial, academic, and government laboratory partners (see, e.g., www.nist.gov/combi).

However, even fast growth of this type leaves an important question unanswered: do the trends we are currently seeing reflect hype, or do they represent a real paradigm shift for polymer science? Clearly we personally believe that this excitement goes beyond hype. We hope that the collection of contributions from both academia and industry assembled in this Special Issue will help others to answer this question.

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