eXPRESS Polymer Letters Vol.14, No.9 (2020) 793
Available online at www.expresspolymlett.com
https://doi.org/10.3144/expresspolymlett.2020.65

Editorial corner – a personal view
Are polymers still 'black sheep' in materials science?

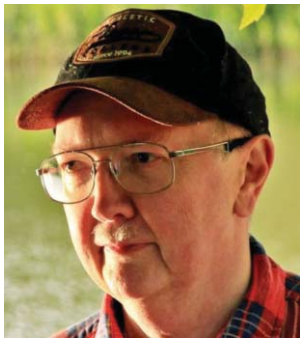
*Gy. Bánhegyi**

Medicontur Medical Engineering Ltd., Herceghalmi út 1., 2047 Zsámbék, Hungary

I have recently read a book by R.W. Cahn published almost 20 years ago (in 2001) on 'The Coming of Materials Science' (ISBN 9780080426792). Based on personal experience the author describes the 'birth pangs' of this extraordinary science which received mixed reception not only in Europe but also in the United States, where in many respects, it was born as an independent discipline in the 1940s and 50s. The book contains several anecdotes, personal memories, invaluable photos. This discipline was disliked by theoretical physicists as a 'pseudo-science' dealing with 'undefined, impure' samples. At least, in the beginning, they frowned upon the level of mathematical approaches used to describe (or explain) the observations. Metallurgists, on the other side, thought that they knew more about metals by experience than these 'newcomers' who relied on physical-theoretical understanding. Gradually, however, metals, alloys, semiconductors (!), and even ceramics became a legitimate subject of study. Polymers received even more reluctant acceptance to the gradually developing family. There was 'too much chemistry' in them. Moreover, they even did not have a well-defined molecular mass or sharp melting point. At first, even the existence of chain molecules was doubted, and, in the first half of the 20th century Staudinger had to fight to convince their fellow chemists that his concept is reality. The 'conversion' of some former metal physicists to polymer science with their rigorous approach and the involvement of excellent physical chemist helped a lot to gain reputation even in materials science.

Recently, however, growing 'popularity' of polymers is experienced in materials science. It turned out that the glassy state of matter is much more universal than thought before (low molecular liquids, metals, ceramics, silicate, phosphate, fluoride 'glasses' etc.). The dynamics of these systems is essentially the same; only the time and size ranges are different. Confined molecules at interfaces, nanopores etc. behave similarly whether polymeric or not. Gels as 'non-ergodic systems' became important not only in biomedical science but also as subjects of extremely involved scattering experiments. Polymers are at the forefront of new technology, electrospinning that allows the laboratory or mass scale production of a wide range of fibrous mats with well-defined and tailored properties. Fibers of polymeric precursors can be transformed into carbon fibers, ceramic fibers that can be used as electrode materials, sensors, catalysts etc.

So, the last 20 years proved that polymers could and do contribute to materials science, by providing unique model systems, and as easily manipulated substances to achieve peculiar morphologies and properties. Despite some still existing 'separation' of sub-disciplines within material science and technology, we can expect the further emergence of unified concepts and methods that are valid for a wide range of materials.



Dr. György Bánhegyi
Member of the Executive Editorial Board

*Corresponding author, e-mail: gybanheg@t-online.hu