Large Scale Fractionation of Polymers for Special Applications

<u>John Eckelt</u>, Bernhard Anton Wolf

Institute of Physical Chemistry, University of Mainz, D-55099 Mainz Germany

The molecular weight and the molecular weight distribution of polymers have great influence on their properties. In many cases these values decide whether a product fulfills its propose or not. It is therefore desirable to control the molecular weight distribution of polymers. This is not only important for basic research and for high performance polymers for industrial applications, but also for medical purposes. Examples from the latter field are hydroxyethyl starch (HES) and hyaluronic acid. HES is made of corn and serves as blood plasma expander. The low molecular weight material is ineffective, because it passes the kidneys too fast and the very high molecular material is undesirable, because it is stored in the body and leads to itching. Hyaluronic acid is either gathered from rooster combs or biotechnologically. This polymer is used for many medical purposes and should be optimized with respect to the molecular weight distribution for the particular application.

Access to sufficiently large amounts of material with adequate molecular and chemical uniformity from polydisperse natural products or synthetic materials has been a long-standing challenge to polymer scientists. During the last years we have developed two broadly applicable preparative fractionation methods. The older procedure, called CPF (Continuous Polymer Fractionation) [1,2], can be successfully applied to many polymers but exhibits some drawbacks. With the solutions of highly viscous polymers it requires uneconomically large amounts of solvent and time. For this reason we have worked out and patented a new procedure we named CSF (Continuous Spin Fractionation) [3]. The improvements are achieved by means of spinning nozzles through which the concentrated polymer solutions are pressed into a liquid of tailored thermodynamic quality. The initially produced jets of the source phase produced in the manner disintegrate rapidly into minute droplets of typically 50 µm diameter. This efficient subdivision provides the large surfaces and short routs of transport required for successful fractionation. The poster demonstrates how CSF can be implemented to new polymers.

Literature

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[3] Eckelt, J., Haase, T., Loske, S. and Wolf, B.A. (2004) Macromol. Mater. Eng. **289**, 393.