letters

On the feasibility of determining porosity properties of particles by inverse gel permeation chromatography

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Recently, Capillon, Audebert and Quivoron[1] questioned the determination of porosity properties of swollen macroporous gels by inverse gel permeation chromatography (i.g.p.c.). They concluded that one cannot hope to obtain precisely the contribution of size exclusion mechanism in the pores by subtracting the partition effect from global retention observed. This conclusion is correct only if substantial partition effects exist under the conditions of the experiment. This was the case in their experiments because of an unsuitable choice of mobile phases. Therefore, the results obtained cannot be considered to be conclusive proof that i.g.p.c. may not be used for characterization of macroporous polymer gels. The authors[1] very probably used the mobile phases known as poor swelling agents to eliminate the penetration of solutes into the porous system of the swollen polymer mass. As a result, experimental conditions arose that were quite unsuitable for i.g.p.c.

Moreover, the merit of i.g.p.c. does not lie in the determination of porous structure of polymer materials in non-swelling media. Such information can be more or less satisfactorily derived from classical porosimetric measurements. I.g.p.c. is practically the only method that makes investigation of polymers in the swollen state possible. Polymer materials swell in solvents characterized by a value of solubility parameter δ_e similar to the value of solubility parameter δ_g of the investigated polymer gel, in which case, as is evident from relationship (2) in the paper discussed[1], discrepancies due to complementary retention by enthalpic interactions of solutes with the macromolecular skeleton are minimized and retention can be regarded as predominantly controlled by steric effects, even in the swollen polymer gel. For the investigation of styrene–divinylbenzene copolymers mentioned in ref. 1, tetrahydrofuran[2] or dichloromethane[3] would be convenient solvents. It was shown that not only the macroporosity contribution can be separated from that of porosity of swollen gel[2], but also valuable information concerning the morphology of swollen polymer gel[4] can be obtained under conditions described above.

In my opinion the paper by Capillon *et al.*[1] serves as a warning for investigators to avoid improper application of i.g.p.c. rather than as a demonstration of the inefficiency of this valuable method.

References

1 Capillon, J., Audebert, R. and Quivoron, C. *Polymer* 1985, **26**, 575
2 Freeman, D. H. and Poinescu, I. C. *Anal. Chem.* 1977, **49**, 1183
3 Halasz, I. and Vogtel, P. *Angew. Chem.* 1980, **19**, 24
4 Jeřábek, K. *Anal. Chem.* 1985, **57**, 1598

International Union of Pure and Applied Chemistry Commission on Macromolecular Nomenclature Note on the terminology for molar masses in polymer science

Basic terminology for molar masses is a matter of prime importance in polymer science. This note is published in the endeavour to establish more uniform and consistent use of the individual names and associated dimensions and/or units.

The two fundamental recommended terms and symbols are: *molar mass* (symbol M) and *relative molecular mass* also called *molecular weight* (symbol M_r).

Molar mass is a mass of a substance divided by amount of substance (ref. 1, name 2.3.03).

Relative molecular mass or *molecular weight* is the ratio of the average mass per formula unit of a substance to 1/12 of the mass of an atom of nuclide ^{12}C (ref. 1, name 2.3.02).

Notes:

(1) Molar mass is usually expressed in g/mol or kg/mol units. The g/mol unit is recommended in polymer science, since then the numerical values of the molar mass and the relative molecular mass of a substance are equal.

(2) Relative molecular mass or molecular weight is a dimensionless quantity and must not be associated with any units.

(3) The use of the dalton as a unit of mass, identical with the atomic mass unit, is not encouraged.

(4) The terms 'molar' and 'molecular' may be used as well for particles consisting of more than one molecule, such as complexes, aggregates, micelles, etc.

(5) If there is no danger of confusion, the subscript r in the recommended symbol for the relative molecular mass, M_r, may be omitted.

(6) Hybrid terms, such as weight-average molar mass or mass-average molecular weight, should be avoided.

Reference

1 Manual of Symbols and Terminology for Physicochemical Quantities and Units, *Pure Appl. Chem.* 1979, **51**, 1