Physisorption of Gases, with Special Reference to the Evaluation of Surface Area and Pore Size Distribution

Gas physisorption experiments are essential for the development of areas such as gas separation and production, gas analysis (e.g., of concentration of trace amounts and of chromatography), gas storage (e.g., of hydrogen and methane), and purification of gas exhausts (e.g., the elimination of sulphides and carbon dioxide). Now characterization of adsorbents by gas physisorption is also required when they are to be used in liquid media (e.g., for the delayed release of drugs or fertilizers, for high-performance liquid chromatography, or for the analysis and separation of bio-liquids). In fact, surface area, pore size, and porosity characterization of porous solids and powders by physical adsorption is a standard tool in academia and industry. To aid such characterization, an IUPAC report entitled "Reporting Physisorption Data for Gas/Solid Systems, with Special Reference to the Determination of Surface Area and Porosity," was published in 1985 (K.S.W. Sing, D.H. Everett, R.A.W. Haul, L. Moscou, R.A. Pierotti, J. Rouquerol, and T. Siemieniewska, *Pure and Applied Chemistry*, vol. 57, issue 4, 603–619 [1985]). The recommendations in the 1985 report have been broadly followed and frequently cited by the scientific and industrial community. In fact, the report is included in more than 4000 citations according to Web of Science!

Over the past 25 years, major advances have been made in the development of nanoporous materials with uniform, tailor-made pore structures (e.g., mesoporous molecular sieves, carbon nanotubes and nanohorns, microporous-mesoporous carbons, and silicas with hierarchical pore structures). Their characterization has required the development of high-resolution experimental protocols for adsorption of various subcritical fluids (e.g., nitrogen at 77K, argon at 87K, carbon dioxide at 273K), organic vapors, and supercritical gases. Furthermore, novel methods based on density functional theory and molecular simulation (e.g., Monte-Carlo simulations) have been developed to allow a more accurate and comprehensive pore-structure analysis to be obtained from the high-resolution physisorption data. It is evident that these new procedures, terms, and concepts now necessitate the updating and extension of the 1985 recommendations. As a consequence an international, well-balanced IUPAC task group on Physisorption of Gases, with Special Reference to the Evaluation of Surface Area and Pore Size Distribution was approved by IUPAC in March 2010. The first meeting of this task group was held on 25 May 2010, in Hyoo, Japan. It is notable that K.S.W. Sing and J. Rouquerol are task group members of this new Division I project, as both were leading members of the 1985 task group. The objectives of the new project are the following:

i. to provide authoritative, up-to-date guidance on gas physisorption methodology
ii. to draw attention to the advantages and limitations of using physisorption techniques for studying solid surfaces and pore structures, with particular reference to the determination of surface area and pore size distribution (hence the work of this IUPAC task group will allow one to recommend the changes required to clarify and standardize the presentation, nomenclature, and methodology associated with the use of gas physisorption in different areas of pure and applied research)
iii. to publish this work as an *IUPAC Technical Report*, which should be considered an update of the 1985 report

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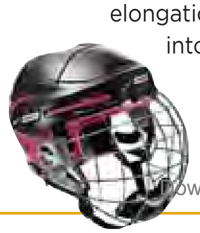
Relation between Rheological Properties and Foam Processability for Polypropylene

Polypropylene (PP) foam is in great demand in industry for a variety of applications (e.g., automobile parts, food trays and packaging, insulators, and shock absorbers) because of its heat resistance, stiffness, and recyclability. However, it is difficult to obtain low-density foams with fine cell structure, especially from uncross-linked PP, because of the lack of melt elasticity. In this project, a newly developed processing modifier, acrylic-modified polytetrafluoroethylene (PTFE), will be employed to enhance the strain-hardening in elongational viscosity of PP. PTFE deforms into a fibrous structure during mixing



The padding in hockey helmets is made of polypropylene foam.