22.4-2   ON THE INTERPRETATION OF SMALL-ANGLE X-RAY SCATTERING FROM MICROEMULSIONS. By T.R.Welberry and Thomas N. Zemb. Research School of Chemistry. Australian National University. CANBERRA. Australia.

Over a broad range of compositions the small angle scattering from microemulsions features a broad peak in the scattered intensity, followed by a power-law decrease at higher angles. The position of the peak defines a length-scale for the micro-structure which any model of the system must take account of. However, there are also other physical constraints that the structural model must satisfy. For micro-emulsions made without cosurfactant the surface area of the interface between the polar and non-polar media is determined by the number of surfactant molecules present. since these form a monolayer at the interface. Another constraint on the system is the degree of curvature of the interface that may be tolerated by the monolayer of surfactant molecules. This has been quantified in the packing parameter V/al which has been used with success to predict the stability range of the microemulsion phase. A further constraint is the necessity to account for the fact that the electrical resistivity of the microemulsion may vary by several orders of magnitude over a region of the phase diagram where the SAXS peak varies very little. Models that are currently in use to describe the structure of micro-emulsions appear incapable of simultaneously satisfying all of these constraints.

The SAXS intensity pattern. however. cannot be uniquely attributed to a particular model. since it contains only information concerning the two-particle correlation function of the real-space distribution and information relating to higher-order (many-particle) correlation properties is simply not present. Consequently. it is possible for a whole range of different models to give essentially the same diffracted intensity and the X-ray experiment alone is incapable of choosing between them. The observed SAXS pattern does however provide a rigid constraint on the possible micro-structural model. and in this paper we show. with the use of Monte Carlo and Optical Transform methods. how this constraint may be applied and how the degrees of freedom remaining to the micro-structure can be explored.

22.4-3   EFFECTS OF DRYING ON THE FRACTAL STRUCTURE OF GELS OF SILICA. By A.F. Craievich, Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro and Laboratório Nacional de Luz Sincrotron/CNPq/MCT. Campinas, SP, Brasil, D.I. dos Santos and M. Aegerter, Instituto de Física e Química de São Carlos, USP, São Carlos, Brazil, T. Lours and J. Zarzycki, Laboratory of Vitreous Materials, University of Languedoc, Montpellier, France.

Aerogels have been prepared by hypercritical drying of humid gels, which were obtained from various hydrolised solutions of TMOS-methanol. Their compositions vary from 20 to 100% vol of TMOS content, being in the mol ratio $H_2O/TMOS = 4$. Their structures have been studied by small angle X-ray scattering (SAXS) using synchrotron radiation (LURE, Orsay), BET and density measurements. SAXS results indicate that all structures are volume fractals ($D_y < 3$). For basic and neutral gels the fractal dimensionality and apparent radius of gyration decrease for increasing TMOS content. Cross-over points were observed in SAXS curves for basic and neutral gels, indicating the existence of structural units having an average radius of 8.5 Å and 13.5 Å for neutral and basic gels, respectively. The increasing values of BET surface area, ranging from 400 m²/g for basic gels up to 850 m²/g for acidic gels, support these conclusions.

22.5-1   A GENERALIZED CRYSTALLOGRAPHY.
By R. Hosemann, Gruppe Parakristallforschung, c/- BAM, Berlin, Germany.

Paracrystalline research deals with the problems of substructures of matter, inorganic or organic, liquid or solid, amorphous or microcrystalline. In order to obtain the necessary information, specialized diffraction techniques are necessary which then allow the identification of microparacrystals and their mutual arrangements. This science is a mathematically well defined blend of theories by M.V. Laue, P.P. Ewald, P. Debye and L.D. Landau. It is essential for the development of a better understanding of the properties of a variety of materials used in many applications such as plastics, synthetic polymers, biopolymers, catalysts, glasses, amorphous metals, liquid crystals, liquids etc. In manifold publications it has been proved that all these materials consist of microparacrystals (the so called "mpc's"). The information obtained is of great importance particularly in modern technology of new composite materials and covers a majority of matter till now not completely understood.