13.3-1 A NEW ISOMORPHOUS REPLACEMENT METHOD IN SMALL-ANGLE NEUTRON SCATTERING. By I.N. Serdyuk and M.Yu. Pavlov, Institute of Protein Research, Academy of Sciences of the USSR, Pushchino, Moscow Region, USSR.

A new approach is proposed for the study of macromolecules in solution by small-angle neutron scattering. The standard experimental approach is based on detection of the difference between scattering from a solution of identical particles and scattering from the solvent. In our method we suggest to measure the difference between the scattering of a solution containing two types of structurally identical particles differing only in degree of deuteration and the scattering of a solution containing particles of a third type deuterated to an intermediate degree. It is assumed that the number of particles N in both solutions is equal and the relation

$$\rho_3(\vec{r}) = (1-\delta)\rho_1(\vec{r}) + \delta\rho_2(\vec{r}) \quad (1)$$

between the scattering densities of the particles of the three types $\rho_1(\vec{r})$, $\rho_2(\vec{r})$ and $\rho_3(\vec{r})$ is held (δ is the fraction of the particles of the second type in the first solution). Theoretical consideration shows that the contribution of the solvent scattering and the contributions of the interparticle interference to the scattering intensity of the first solution and to the scattering intensity of the second solution are identical. Thus the difference scattering intensity is not influenced by the interparticle interference and the solvent scattering. Moreover, the following equation is valid:

$$I_1(s) - I_2(s) = \delta(1-\delta)\cdot N\cdot I_F(s) \quad (2)$$

where $I_F(s)$ is the scattering curve of the particle with the scattering density $\rho_F(\vec{r})$ equal to the difference of scattering densities of the particles of the first and the second types:

$$\rho_F(\vec{r}) = \rho_1(\vec{r}) - \rho_2(\vec{r}) \quad (3)$$

It follows that the components equally deuterated (protonated) in the particles of the first and the second types will make no contribution to the difference scattering curve and therefore will be "invisible" for neutrons. Thus, the suggested method can be considered as a new version of the contrast variation method. It is important to note that unlike the conventional method, the new one can make invisible several particle components differing by their scattering properties.

The method can be used to solve problems which can hardly be solved using standard approaches. For example, elimination of interparticle interference and solvent scattering contribution may be important for the study of charged particles and for comparison of biopolymer conformations in two functional states in which the biopolymer can have different tendencies to association. The new method seems to be particularly appropriate for the study of multicomponent biological particles. A combination of the possibility of obtaining the scattering curve of an individual particle with the possibility of "highlighting" the selected components in a large structure may become decisive in overcoming the difficulties connected with the necessity to use concentrated solutions when studying components of complex biological particles or their mutual arrangement.

13.3-2 SMALL ANGLE NEUTRON SCATTERING STUDIES ON BRIJ-58 MICELLES. By J. Schefer,[+] R. McDaniels[++] and B. P. Schoenborn,[+,++]

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Brij-58 is a nonionic surfactant used to solubilize membrane proteins such as Na/K ATPase. Small angle neutron scattering measurements were performed on Brij-58 micelles to determine their radius, aggregation number, molecular weight and shape. The radius of gyration of the micelle at infinite contrast is 32 Å, and its volume is 291,000 Å^3. The aggregation number is 71 molecules per micelle, based on a molecular weight determination by forward scattering. The Stuhrmann plot is linear, indicating a centrosymmetric distribution of the scattering density. A two shell spherical model is derived, consisting of a central hydrocarbon core and an outer shell of the headgroups, intermixed with water.

13.3-3 **SANS INVESTIGATION OF HIGH TEMPERATURE PRECIPITATION IN Al-Mg ALLOY.** By S. Abis (Aluminia, Novara, I), R. Coppola (ENEA-Casaccia, Roma, I), D. Juul Jensen (Risø Nat.Lab. DK), M. Magnani, M. Stefanon (ENEA-Bologna, I)

Nucleation and growth of Mg_2Al_3 precipitates in an Al-Mg 10% alloy were studied as a function of time during high-temperature ageing by Small-Angle Neutron Scattering (SANS). The 2-dimensional scattering patterns, obtained at Risø SANS facility are analysed taking simultaneously into account measurements obtained with two different wavelengths. Thermal treatments were performed by ageing at 150°C for 1,3,5 and 7 days. SANS data are also discussed with reference to electron microscopy observations performed on the same samples (*). The influence of a possible variation of the precipitate shape (during ageing) on SANS data is also considered.

(*) S. Abis, R. Coppola, M. Stefanon, Proc. XI ICEM, Kyoto 1-7.9.86, Vol. II, p. 1613.