ICANS-XIII
13th Meeting of the International Collaboration on
Advanced Neutron Sources
October 11-14, 1995
Paul Scherrer Institut, 5232 Villigen PSI, Switzerland

SCIENCE WITH NEUTRONS

Masatoshi Arai
Kobe University, Department of Physics, 1-1 Rokkodai, Nada, 657 Kobe, Japan

In this session we had five talks all together. The first two talks were on scientific results from SANS. The talk by R. Hjelm et al. (LANL) was on an industrial application of SANS. They studied the microscopic structure of carbon black in mobile tires. They found that the carbon black particles of several 10 nm, which have graphitic carbon shell with amorphous carbon in it, aggregate together by strong covalent bonds and form a one dimensional rod of several 100 nm. This kind of basic structural study on consuming goods is a promising demonstration of industrial use of neutron scattering and will give some guidance in improving them and to become more economical.

I. Serdyuk et al. (INR) developed clever ideas on the contrast variation method by introducing fractional hydrated and dehydrated substitution, so called triple level isotopic substitution. By this method it can be possible to extract single particle structure without the particle-particle interference term. They demonstrated a successful example of the observation of the structure of the core RNA only in 50S proteins.

The third talk was given by Y. Kamyshkov (ORNL) who talked about experiments to observe a possible neutron-antineutron transition. Because the characteristic transition time is so long, ~$3x10^8$ s, the key issue on this kind of research is to make neutron flux as high as it can possibly be. They proposed a sort of focusing mirror guide so as to have the focal point at the detector surface 150 meters away from the reactor core, giving a 10'000 times enhancement in the neutron flux. He also emphasized to have colder neutron source in order to have more efficiency on the proposed mirror.

U. Steigenberger (RAL) summarized the kind of single crystalline excitation measurements that have been performed so far in pulsed neutron sources. In the early stage of history of pulsed neutrons, people did not admit any advantage on this kind of study. However, large arrays of detectors for TOF-type spectrometer together with rapid increase of computing power has made it possible to observe S(Q, E) in a wide range of the Q - E space simultaneously. Now it has become possible to obtain a constant-E and -Q scan in the computer memory if we wish. She raised future challenges for TOF spectrometer as follows: 1) high resolution capability for small energy transfer, 2) dispersion curve measurement of complex systems, 3) polarization analysis and 4) extremely high intensity spectroscopy.

The final talk was given by M. Johnson (RAL) on a new figure-of-merit (FOM) of instruments, which is INFORMATION. He gave a formalism of the INFORMATION by taking into account intensity, resolution, dynamic range etc. He showed how the INFORMATION of typical instruments develops with measuring time and he discussed its importance on designing and optimizing an instrument.