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A new small angle neutron spectrometer

The special section on 'Soft Condensed Matter' published recently in *Current Science* (2001, **80**, 948–1042) dealt with a variety complex materials whose structure in terms of size, shape and distribution of the constituents is of basic interest. The structures could be sensitive to changes in temperature, small changes in concentration of additives, etc. One of the techniques to study the structural parameters is referred to as 'small angle scattering' (SAS). The scattering profile from a specimen of interest is measured as a function of the 'wave–vector transfer' in a radiation scattering experiment. One can use light, X-rays or cold neutrons as the probing radiation depending on the expected size of the constituents taking into account relevant material characteristics. Small angle X-ray scattering (SAXS) and Small angle neutron scattering (SANS) can give complimentary information.

SAXS instruments are commercially available whereas SANS instruments have to be in-house or custom built to suit the neutron source intensity and other considerations. One SANS instrument based on a beryllium filtered beam and a one-D position sensitive detector operated for nearly two decades at the CIRUS reactor, BARC, Mumbai. Although this instrument happened to be a rather simple one compared to the sophisticated ones in overseas labs, it turned out to be one of the most sought after instruments for studying a variety of micellar and other systems by scientists at BARC as well as by the university research community. The instrument also provided initial data on many systems based on which detailed studies could be undertaken at overseas labs.

The resolution of the instrument described above was, however, somewhat limited, being constrained by the low flux at CIRUS reactor. At the DHRUVA reactor at BARC – a higher flux reactor – several new instruments and other facilities are established. One of the important facilities is a pair of neutron guides which allows cold neutrons to be transported to a laboratory outside the main reactor hall where experiments can be conducted. At this 'Guide laboratory', the background radiation is low with the result that the instruments located here possess good signal/background ratio; the intrinsic cold neutron intensity is also large compared to that in the CIRUS instrument. Keeping with the tradition of indigenous instrument design and development, the scientists at BARC have now commissioned a new SANS instrument. Mazumder *et al* describe the technical features of this instrument in a General Article (**page 257**) in this issue. The design of this instrument is different from that of the CIRUS SANS instrument in that it makes use of a two-crystal arrangement; notably the sample being studied rests at the center of the line joining the two crystals. The SAS profile is measured by scanning the second crystal along with a simple BF_3 detector. The article also deals with the initial calibration studies using three sintered alumina samples and comparing the data with those obtained at the ILL reactor, Grenoble on the same specimens. The wave–vector transfer range covered by this instrument is 0.003 to 0.173 nm^{-1} allowing studies of systems containing constituents of size in the range 2000 to 40 nm. It is hoped that new results from other complex materials will emerge in the near future.

K. R. Rao

Nodulin promoters in transgenic rice

Symbiosis is at the heart of biology. The interdependence of organisms and fruitful coexistence of species are essential for life. Nitrogen fixation, the ability to convert inert atmospheric dinitrogen to chemically usable ammonia, is an ability restricted to a few organisms. The ability of rhizobia to carry out nitrogen fixation is used by leguminous host plants which provide them refuge, supplying remarkable shelters, nodules, which allow functioning of the nitrogenase system. This complex symbiotic interaction is mediated by signalling events in which plant flavonoids induce bacterial 'nodulation' gene expression, a process that turns on the nodule development pathway in the plant. 'Nod' factors, lipochito-oligosaccharides, induce a wide spectrum of physiological changes.

On **page 270**, Terada *et al.* describe an attempt to demonstrate that early nodulin gene promoters can be used to control reporter gene expression in transgenic rice. They also examine the responses elicited by externally applied Nod factors. While rice does not contain a receptor for a rhizobial nod factor, they have found conditions under which expression patterns for the transgene are observed. As the authors note, 'it is however, conceivable that a receptor for oligochitin fragment or for the lipid tail perceives the signal and activates a hypothetical cascade . . .'. Where will such studies eventually lead? Presumably, the goal will be to engineer the nodule generation and nitrogen fixation systems into non-legume plants. The choice of rice is significant and it is of some interest that 'nodule formation' can be mimicked by 2,4-dichlorophenoxyacetic acid as demonstrated several years ago.

P. Balaram