In this issue

Surface characterization

The rapid development of 'Surface Characterization Techniques' over the last few decades is intimately related to the growth of semiconductor industry and to the never-ending quest of smart miniaturized devices, where the number of atoms at the surfaces and interfaces becomes comparable to that present in the bulk[1,2]. Electron and ion beams were quite the obvious choices for studying surfaces of solid materials, primarily due to the lower penetration depth of these radiations as compared to X-rays and neutrons. Although surface characterization of materials using X-rays[3] and neutrons[4,5] were demonstrated fifty years before, most of the text books[6,7] on surface science emphasized the use of techniques based on electrons and ions, for characterization of surfaces.

As we learned more about surfaces, it became obvious that a surface is not an inert slice of bulk materials. It may have its own structure, electronic configurations and dynamics[8]. A well characterized surface is an ideal system to test out our ideas in two-dimensional physics not only in traditional solids like metals and semiconductors but also in liquids, polymers and other organic materials, referred to as soft condensed matter[9]. Moreover for designing new materials, artificial surfaces – known as interfaces, between dissimilar materials – were created in layered structures and in clusters and nanocomposites. The research in surfaces, interfaces and clusters has undergone a phenomenal growth and most of the journals in condensed matter physics and materials science started a separate section to cover this subject.

The role of X-rays and neutrons in the nondestructive characterization of surfaces and interfaces in these novel materials has become very important for several reasons. Some of the important reasons are: (a) availability of intense X-ray and neutron sources, (b) improvement in our theoretical understanding of scattering processes from surfaces and interfaces[10,11], (c) importance of interfacial structure and roughness in determining physical and chemical properties of these materials and (d) rapid increase in the research activity involving liquids and soft condensed matter, which cannot be easily put in ultra high vacuum chamber. Considering these aspects, and the fact that only a few monographs[12–14] on this subject have just come out, in this issue **(page 1445–1531)**, we have focused our attention to the above-mentioned new developments.

Scanning Probe Microscopy[15] is another technique, which is finding wide application in surface characterization of various materials. Real space surface images obtained from this technique provide information complementary[16] to the statistically averaged reciprocal space information obtained from scattering techniques. In this issue, we have included a review article on this microscopy technique along with three review articles to explain basics of neutron reflectivity, X-ray reflectivity/diffuse scattering and grazing angle diffraction techniques. We have also included two other review articles to illustrate the applications of these techniques, one on liquid surface and the other on semiconductor surfaces and interfaces. Six short articles from some of the active laboratories provide an impression of activities in this field in India.

It is really satisfying to note that well-known scientists have written the six review articles. I thank them. I also thank the authors of the short articles. It was a pleasure to edit this special section and I owe my thanks to K. R. Rao. We feel that this special section will encourage scientists and young research students, working in the field of materials science and condensed matter physics, to study this evolving subject.

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