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Laurence Marks

"Oxide Surfaces"

While we understand relatively well the structure of metal surfaces and semiconductors, in many other cases (particularly for oxides) we do not yet. Part of the problem is experimental, part theoretical; DFT can be quite unreliable for oxides, particularly strongly correllated transition metal system. As a consequence, it is still hard to guess a plausible structure for an oxide surface. Direct methods developed originally for bulk materials avoids the need to guess. We have been able to apply them to both surface transmission electron and x-ray diffraction data, determining some unexpected oxide structures that one would not guess. From these results it is now starting to become clear that the rules controlling oxide surfaces are not physics or materials science but inorganic polyhedral co-ordination chemistry. This presentation will give an overview of some recent results on oxide surfaces. Peering into the crystal ball, Prof. Marks will mention some recent work refining charge density at surfaces, and the potential for doing this routinely with brighter sources.

Laurence Marks is a Professor of Engineering in the Department of Materials Science and Engineering at the Robert R. McCormick School of Engineering and Applied Science at Northwestern University. He received his Ph.D. in physics in 1980 from Cambridge University. He was the recipient of a Sloan Foundation Fellowship in 1987, the Burton Medal from the Electron Microscopy Society of America for achievements in electron microscopy by a young researcher in 1989, and was elected a Fellow of the American Physical Society in 2002. His research interests cover a wide range of topics, such as direct methods, nanoparticles, surface structures, quantum electron crystallography, surface charge density, self-lubricating cutting tools, environmental catalysis, tribology and the nanoscale structure of cement. He is the author or co-author of more than 250 papers.

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