Strain Mapping Methods and Instruments: Recent Advances and Future Implications

Michael E. Fitzpatrick, *Department of Materials Engineering, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK*. E-mail: m.e.fitzpatrick@open.ac.uk

Neutron diffraction is now a relatively mature technique for strain mapping in engineering materials and components. Synchrotron X-ray diffraction methods are developing rapidly, and for some applications offer more efficient data collection. The fundamental principles of diffraction methods for strain determination, and subsequent calculation of stress, are well-understood. Much of the improvement in the applicability of neutron and synchrotron X-ray methods in the last 10 years has been achieved by improvements in instrumentation and the development of dedicated diffractometers for strain measurement and mapping. This has allowed for better sample positioning and accommodation of bulkier and weightier samples. At the same time, there have been improvements in neutron optics and our understanding of beam attenuation effects.

This talk will review some of these developments, in the context of the new engineering-oriented diffractometers that have been developed in the last five years. Results will be presented from applications that could not have been achieved ten years ago. It will also look forward to the possibilities of future developments which will further expand the scope and applicability of engineering diffraction measurements of strain.

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