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SUBMICRON X-RAY DIFFRACTION AND ITS APPLICATIONS TO MATERIAL SCIENCE PROBLEMS

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The availability of high brilliance 3rd generation synchrotron sources together with progress in achromatic focusing optics allow to add submicron spatial resolution to the conventional century-old X-ray diffraction technique. The new capabilities include the possibility to map in-situ, grain orientations, crystalline phase distribution and full strain/stress tensors at very local level, by combining white and monochromatic X-ray microbeam diffractions. This is particularly relevant for nowadays industry where the understanding of material properties at microstructural level becomes increasingly important. After describing the latest advances in the submicron X-ray diffraction technique at the ALS, we will give some examples of its application in material science for the measurement of strain/stress in metallic thin films and interconnects, MEMS devices and composite materials. Its use in the field of environmental science will also be discussed.

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