Studies of crystal morphology using coherent X-ray diffraction.

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We are trying to develop techniques for investigation of the structure and dynamics of crystal surfaces using the highly coherent X-ray beams that are now available at third-generation synchrotron X-ray sources. Coherent diffraction differs from its incoherent counterpart in that it is sensitive to the exact locations of all material in the beam, and so does not average over multiple configurations. By reconstruction of real-space images, we have used the technique to "observe" the regrowth of monolayers of oxide on stripped Si surfaces. We have also applied it to the study of antiphase boundaries as well as individual crystal grains in powders.