

HW Number 5, Due May 9th

1. Consider a 200kV electron colliding with an isolated oxygen atom. What is the maximum energy that can be transferred to the oxygen atom by a ballistic (knock-on) process? (Look up the relevant formula.)
2. Give two different and independent ways of using an inclined stacking fault to determine the thickness of an fcc crystal.
3. Consider a copper sample imaged close to the $[001]$ zone, tilted by 100 mRad about $[100]$ with the (200) spot in an exact 2-beam condition. Assuming kinematical theory, sketch the dark field image of a square pyramid with four (111) faces and a (001) base when using the (-200) diffraction spot, where the width (in projection) of the pyramid is 100nm.
4. For a bcc material, a diffraction pattern taken along $[001]$, all the diffraction spots show streaks running along (100) and (010). Using imaging, design a set of experiments to determine what these are due to in real space. (Hint: be careful and systematic, otherwise you will never get anywhere. Think about the relationship between real and reciprocal space.)