

Direct Recoil Spectroscopy - Principles and Applications

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The use of low energy recoil ions has been demonstrated to provide a sensitive probe of electronegative adsorbates on surfaces. Using inert gas projectiles, it is possible to probe the adsorbate site and the composition to detection limits of 10^{-4} monolayers. This technique has been applied to a number of surface studies which will be reviewed.

Despite this work there is yet no clear guidance for experimentalists to choose the most sensitive conditions under which measurements should be made. While the physical principals are known, they have yet to be quantified and hence optimised. With recent detailed studies of charge fractions for oxygen scattered from an Al surface, it is now possible for the first time to compare the scattered ion yields for different inert gas projectiles and hence to optimise the experimental conditions.

The primary consideration would be to determine the maximum ion yield as a function of cross section and charge exchange however this gives a distorted answer as the resulting experimental conditions are quite unrealistic. Furthermore the prime limitation should not be the yield relative to the number of projectiles, but as a function of the amount of damage those projectiles cause. With this in mind the experimental conditions can be optimised realistically.