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Using High Energy Electrons for Elastic Recoil Detection of Hydrogen*

B. L. Doyle
Radiation-Solid Interactions Department 01861
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-MS1056

Abstract

Materials that incorporate hydrogen are of great interest for both scientific and technological reasons. The Ion Beam Lab at SNL-NM has invented techniques using micron to mm-size MeV ion beams to recoil H and its isotopes (Elastic Recoil Detection or ERD) that can very accurately make such measurements. However, there are many measurements that would benefit the field of materials science and technology that require much better resolution. To address these and many other issues, we have demonstrated that H can be recoiled through a thin film by 70 keV electrons and detected with a channeltron electron multiplier (CEM). The electrons were steered away from the CEM by strong permanent magnets. This has proven the feasibility that the high energy electrons from a Transmission Electron Microscope-TEM can potentially be used to recoil and subsequently detect (e-ERD), quantify and map the concentration of H isotopes with nm resolution.

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