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A Compact Detection System for High Sensitivity Hydrogen Profiling of Materials by Nuclear Reaction Analysis[1] JOSE PACHECO, BEN URBAN, DANIEL MARBLE, Tarleton State University — Hydrogen is a ubiquitous contaminant that is known to have dramatic effects on the electrical, chemical, and mechanical properties of many types of materials in even minute quantities. Thus, the detection of hydrogen in materials is of major importance. Nuclear reaction analysis (NRA) is an ion beam technique capable of non-destructively profiling hydrogen in a wide range of materials from semiconductors to metals with high depth resolution (5 to 10 nm). It can also be used to standardize other techniques like SIMS. However, traditional NRA has found only limited application in the semiconductor industry even to quantify SIMS because of poor sensitivity due to cosmic ray background. Most attempts to eliminate this background to achieve ppm detection levels using higher energy nuclear reactions or tons of passive shielding are not compatible with commercial ion beam analysis space and equipment requirements. We have developed an NRA coincidence detection system that eliminates CSRB and offers state-of-the-art hydrogen detection capability while being compatible with existing IBA space and hardware requirements. A discussion of the detector system, its' design, and our background and efficiency measurements will be presented.

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