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[\[PDF \(606K\)\]](#) [\[References\]](#)**Analysis of Ultra-Thin HfO₂/SiON/Si(001): Comparison of Three Different Techniques**[Kenji KIMURA](#)¹⁾, [Kaoru NAKAJIMA](#)¹⁾, [Thierry CONARD](#)²⁾, [Wilfried VANDERVORST](#)²⁾, [Andreas BERGMAIER](#)³⁾ and [Günther DOLLINGER](#)³⁾1) *Department of Micro Engineering, Kyoto University*2) *IMEC*3) *Institut für Angewandte Physik und Messtechnik, Universität de Bundeswehr München*

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Composition depth profiling of HfO₂ (2.5 nm)/SiON (1.6 nm)/Si(001) was performed by three different analytical techniques: high-resolution Rutherford backscattering spectroscopy (HRBS), angle-resolved X-ray photoelectron spectroscopy (AR-XPS) and high-resolution elastic recoil detection (HR-ERD). By comparing these results we found the following: (1) HRBS generally provides accurate depth profiles. However, care must be taken in background subtraction for depth profiling of light elements. (2) In the standard AR-XPS analysis, a simple exponential formula is often used to calculate the photoelectron escape probability. This simple formula, however, cannot be used for the precise depth profiling. (2) Although HR-ERD is the most reliable technique for the depth profiling of light elements, it may suffer from multiple scattering, which deteriorates the depth resolution, and also may cause a large background.

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