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Atomic Layer Deposited Aluminum Oxide / Tantalum Oxide Laminate Films SEAN W. SMITH, JOHN F. CONLEY JR., School of Electrical and Computer Science, Dept. of Material Science, Oregon State University, Corvallis OR — Nanolaminates offer the possibility of tuning the electrical properties of a dielectric film for specific applications. The use of multiple materials can influence the electrical properties of a film stack and spatial confinement, due to the laminate structure, can affect the crystallization. The conformal, self limiting nature of atomic layer deposition (ALD) makes it ideal for producing thin laminates. ALD was used to deposit nanolaminates of Ta2O5 (k about 25, high leakage) and Al2O3 (k about 8, highly insulating). A MOS test structure was used to look at electrical properties such as dielectric constant, leakage, and breakdown. Spectroscopic ellipsometry, x-ray diffraction, electron microprobe and x-ray reflectivity were used to measure film and bilayer thickness, interfacial roughness, composition, and crystallinity in the laminate. The effect of increasing the number of bilayers, reducing the bilayer thickness, and annealing on the electrical properties and crystal structure of Al2O3/Ta2O5 laminates with a fixed overall composition and thickness is reported.

Sean W. Smith
School of Electrical and Computer Science, Dept. of Material Science,
Oregon State University, Corvallis OR

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