A Heteroepitaxial MIM-Ta_2O_5 Capacitor with Enhanced Dielectric Constant for DRAMs of G-bit Generation and beyond

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We demonstrate a novel MIM capacitor with a heteroepitaxial Ta_2O_5 dielectric, the permittivity of which is as high as 50. The heteroepitaxy of Ta_2O_5 on the Ru electrode changes its crystal symmetry from a conventional orthorhombic system to a hexagonal one. One-dimensional Ta-O-Ta chains along the *c*-axis bring about delocalized electrons, large polarizability and thus enhanced permittivity. This technology is promising for the application of Ta_2O_5 to the G-bit DRAMs.