

World's first MOSFETs with epitaxial Gd₂O₃

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Researchers at AMICA and Technical University of Darmstadt have successfully fabricated the world's first MOSFETs on ultra-thin-body silicon-on-insulator (SOI) material and bulk silicon with a crystalline gadolinium oxide (Gd₂O₃) gate dielectric.

In the last years, the semiconductor industry has intensified its search for alternatives to the well known but increasingly limiting SiO₂ as transistor gate insulator. While hafnium dioxide is seen as a hot candidate, there is increasing evidence that yet other materials may be needed, such as rare earth oxides. In crystalline form and grown with molecular beam epitaxy (MBE), rare earth oxides provide the promise of engineered interfaces to the silicon channel - with near perfect lattice matching and extremely low defect density.

AMICA researchers have now been able to integrate - for the first time - crystalline gadolinium oxide (Gd₂O₃) in their experimental SOI CMOS technology platform. The transistors included titanium nitride metal gates and annealing up to 800°C. Researchers at Technical University of Darmstadt have meanwhile used a replacement gate process with chemical mechanical polishing to fabricate MOSFETs with Gd₂O₃ gate oxide on bulk silicon. These devices are utilized to generate fundamental data for the evaluation of this novel promising material. All films have been grown at partner University of Hannover.

First experimental details will be published in the March/April 2006 edition of the *Journal of Vacuum Science & Technology B*: "Scalable gate

first process for SOI MOSFETs with epitaxial high-k dielectrics" by
H.D.B. Gottlob et al.

Source: AMO GmbH

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