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Bandgap engineering of $SrTiO_3$ via Al-substitution AGHAM POSADAS, CHUNGWEI LIN, University of Texas at Austin, STEFAN ZOLLNER, New Mexico State University, ALEX DEMKOV, University of Texas at Austin —
Epitaxial $SrTiO_3$ is was originally envisioned as a replacement gate dielectric for scaled CMOS technology because of its very high dielectric constant of $\sim$300 at room temperature. However, one critical issue that prevented this technology to be developed is the zero conduction band offset with Si making it unsuitable for use as a gate insulator. We have epitaxially grown Al-substituted $SrTiO_3$ on Si using molecular beam epitaxy, replacing 10-20% of the Ti atoms with Al. We observe a 0.3 eV increase in the band gap by both spectroscopic ellipsometry and electron energy loss spectroscopy. Capacitor structures show a dramatic decrease in leakage current by six orders of magnitude. This approach may allow $SrTiO_3$ to become useful as a gate dielectric on silicon.

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