An Ultra-thin Silicon Nitride Gate Dielectric with Oxygen-enriched Interface (OI-SiN) for CMOS with EOT of 0.9 nm and Beyond

Shimpei Tsujikawa, Toshiyuki Mine, Yasuhiro Shimamoto, Osamu Tonomura, Ryuta Tsuchiya, Kazuhiro Ohnishi, Hirotaka Hamamura, Kazuyoshi Torii, Takahiro Onai, and Jiro Yugami
Central Research Laboratory, Hitachi, Ltd.
1-280 Higashi-Koigakubo, Kokubunji, Tokyo 185-8601, Japan

We demonstrate a SiN gate dielectric with oxygen-enriched interface (OI-SiN). A process in which oxygen atoms are incorporated after forming SiN provides enhanced nitrogen concentration and oxygen-enriched interface simultaneously even in the region of EOT < 1.5 nm. Thus we developed an OI-SiN gate dielectric with EOT of 0.9 nm that brought about low gate leakage current, good interface properties and excellent resistance to boron penetration.