# High-k ゲートスタック MOSFET における電子移動度のリモート界面ラフネス散乱依存性

## Dependence of electron mobility of high-k gate stacked MOSFETs on remote interface roughness scattering

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**【Introduction】** The International Technology Roadmap for Semiconductor (ITRS, 2009) indicates that the effective oxide thickness (EOT) of the gate oxide of metal-oxide-semiconductor-field-effect-transistors (MOSFETs) have already reached around 1 nm. Because in such MOSFETs the interface between gate electrode and gate oxide is too close to the channel of the MOSFETs, the effect of remote interface roughness (RIR) scattering on the carriers in the inversion layer of the channel is necessary to be considered. In this report, we studied the effect of RIR scattering on the electron mobility in the inversion layer of the MOSFETS fabricated using high-k dielectrics as gate oxide.

**【Materials and methods】** In this work, we numerically calculated the RIR-limited electron mobility by taking an exponential power spectrum, which is exponentially decays and isotropic, for the roughness autocorrelation function [1].

**【Results】** Figure 1 shows that the calculated RIR scattering limited electron mobility for the different autocorrelation spectrum form of the interface roughness. The peak value of the RIR-limited electron mobility for the exponential autocorrelation spectrum is larger than in the case of Gaussian autocorrelation spectrum. This might be because of the exponential autocorrelation spectrum decays faster than Gaussian autocorrelation spectrum. This faster decay causes a smaller scattering potential. This smaller scattering potential then caused the exponential autocorrelation spectrum case has a higher electron mobility than in the Gaussian autocorrelation spectrum case.

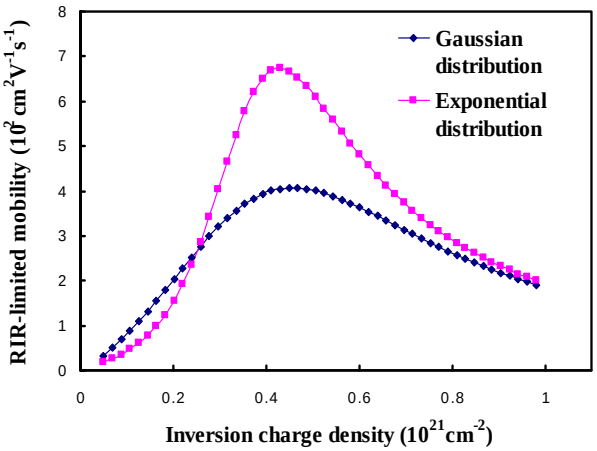


Fig. 1 Calculated RIR-limited electron mobility versus inversion charge density ($T = 35$ K, $\Delta = 0.4$ *nm*, $L = 3$ nm, $T_{ox} = 1$ nm).

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[1] S. M. Goodnick *et al*. Surface roughness at the Si (100)-$SiO_2$ interface, Physical Rev. B, **32,** 8171(1985)