The Interface States at SiO2/polysilicon and SiO2/monosilicon Interface Influence on N-polysilicon/oxide/N-monosilicon Capacitance

H. Dib[1], Z. Benamara[1], Z. Kari and F. Raoult[2]
[1]*Laboratoire de Micro-Electronique Appliquée, Université Djillali Liabes, Sidi Bel Abbès, Algerie*
[2]*Groupe de Microélectronique et de Visualisation-CCMO-URA au CNRS 1648, Université de Rennes I, Campus de Beaulieu, Rennes cedex, France*

The interface states have a very significant role in the components containing MOS structures. We study the interface states densities effect at SiO_2/ Poly-silicon and SiO_2/ mono-silicon surfaces on metal/poly-silicon /oxide/ mono-silicon capacitance. Then, a mono-dimensional simulation of capacitance-voltage characteristics of MS^POS is presented [1]. The numerical solution of Poisson equation and the determination of the charge variation in the structure induced by an application of external bias (V_G) allow us to simulate the capacitance-voltage MS^POS characteristics. The geometrical model assumes that the poly-silicon layer is composed of a succession of defined mean grain size crystallites, separated by lateral grain boundary, which are parallel to the poly-silicon/ oxide interface.

The interface states of mono-silicon/SiO_2 shift the part of the curve that corresponds to the inversion of the substrate (mono-silicon) towards the negative voltage as it appears in Fig. 1. A shift towards the positive voltage of the inversion in poly-silicon layer for the interface states SiO_2 / poly-silicon is shown in Fig 2-a. The Polycrystalline layer is in depletion. A peak appears at the level of the minimum corresponding Poly-silicon layer.

If the Poly-silicon doping concentration is 10^{19} cm^{-3}, the effect of the interface states disappears, which is confirmed by Fig. 2-b. The density of the traps becomes negligible in front of the doping concentration.

Our results are identical to those given by C. Leveugle on capacitances Poly-silicon/SiO_2/ mono-silicon [2].

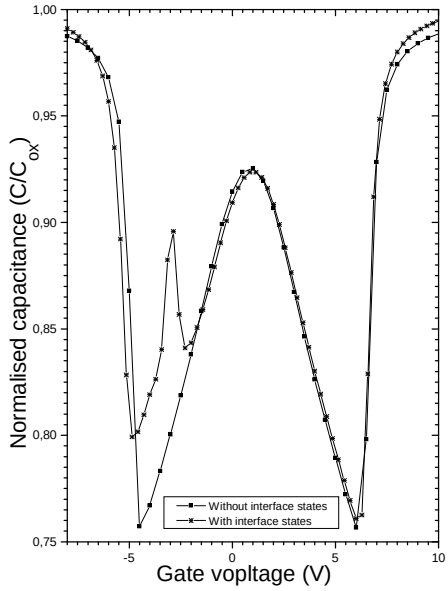
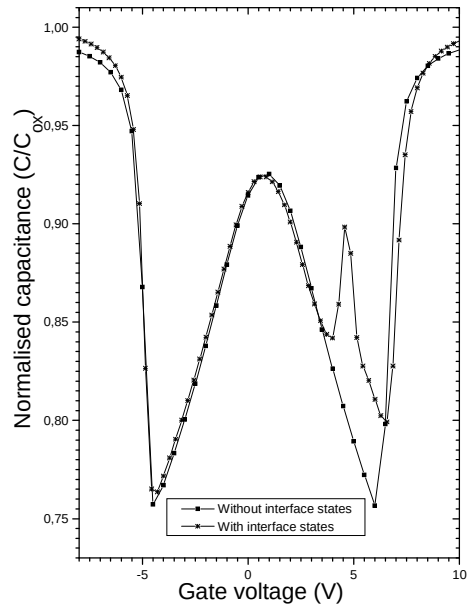


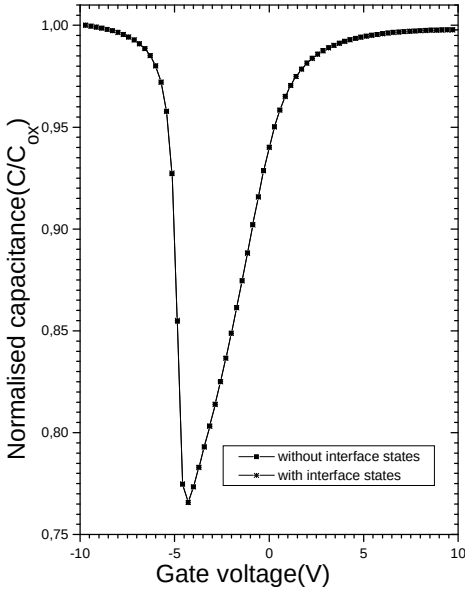
Fig.1: Interface states at monosilicon/SiO_2effect on Quasi-static capacitance Polysilicon doping= monosilicon doping= $10^{17}cm^{-3}$.

References

[1] H. Dib, Z. Benamara, A. Boudissa, B. Zebentout, R. Naoum, F. Raoult and O. Bonnaud, Solid State Phenomena, **67-68**, 559 (1999).

[2] C. Leveugle, P. K. Hurley, A. Mathewson, S. Moran and E. Sheehan, Microelectron Reliab. **38**, N°2, 233 (1998).





(a)

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Fig.2: Interface states at polysilicon/SiO_2effect on Quasi-static capacitance
a) Polysilicon doping= monosilicon doping= $10^{17}cm^{-3}$,
b) Polysilicon doping= $10^{19}cm^{-3}$, monosilicon doping= $10^{17}cm^{-3}$.