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Origins of voltage effect on interfacial magnetic anisotropy at nanoscale: ab-initio simulations ROMAN CHEPULSKYY, DMYTRO APALKOV, Samsung Electronics, Semiconductor R&D Center (Grandis) — We estimate the effect of electric field on Fe—MgO interfacial perpendicular magnetic anisotropy (PMA) from first principles with and without oxygen at interface. Segregation profile of oxygen is constructed. The possible origins of effect are analyzed by comparison of simulations with published experimental data. Previously it was often assumed that voltage controlled anisotropy (VCA) primarily originates from the modifications of electron density of states. We conclude that such mechanism as well as lattice distortions and undiffusive oxygen atoms at interface cannot explain the experimentally observed effects. The oxygen ion electromigration is suggested as a primary possible mechanism of large PMA change in electric field leading to asymmetrical and time dependent effect.

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