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Controlling silicon/TiN interface by plasma induced functionalization for quantum computing applications[1] EVGENIYA LOCK, Materials Science and Technology Division, Naval Research Laboratory, PENG XU, YANIV ROSEN, TIM KOHLER, ARUNA RAMANAYAKA, Laboratory of Physical Sciences, University of Maryland, JOSEPH PRESIGIACOMO, National Research Council, Washington DC, MIKE OSOFSKY, Materials Science and Technology Division, Naval Research Laboratory, MARK KUSHNER, Electrical Engineering and Computer Science, University of Michigan, KEVIN OSBORN, Laboratory of Physical Sciences, University of Maryland — Charged tunneling defects at the superconductor-dielectric interfaces are known to be deleterious to quantum bits (qubits) in superconducting quantum computing. These tunneling defects are believed to be charged atoms or groups of atoms which cause qubit decoherence through electric field modes. Here we investigate the interface of TiN/Si, because this material system allows for high-coherence qubits and resonators. The defects on metal-dielectric interfaces are especially important in a nonequilibrium regime when microwave and bias electric fields are applied simultaneoulsy. In this work, we are discussing the effects of plasma produced -O, -N and -F functional groups on the qubits performance. Furthermore, we present a detailed chemical, structural, morphological surface analysis which are correlated with plasma gas phase chemistry.

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