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Driving conventional semiconductors into topological insulating phase KAI CHANG, SKLSM, Institute of Semiconductors, Beijing, China, KAI CHANG TEAM, DONG ZHANG TEAM, WENKAI LOU TEAM, M. S. MIAO COLLABORATION — Topological insulator (TI) is a central issue of condensed matter physics and has attracted intensive interests recently. TI is a new state of quantum matter possessing insulating bulk and metallic edges. This novel property is caused by a strong spin-orbit interactions (SOIs) in TIs. Usually the topological insulators are narrow band gap systems containing heavy atoms. This requirement limits the members of TIs and its widespread application heavily. Electric fields can drive topological insulator transition in HgTe quantum wells and induces the intrinsic spin Hall effect [1], and can also be used to control surface magnetism of topological insulators [2,3]. More importantly, that conventional semiconductors can be driven into topological insulating phase utilizing the interface polarization induced electric field [4]. We demonstrate theoretically this possibility in GaN/InN/GaN systems. We are moving toward more commonly used semiconductors, such as Silicon.

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