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**A theoretical design of graphene-based spin field-effect transistors** LIXUE LIU, University of Science and Technology of China, SHUDUN LIU, University of Louisville, ZHENYU ZHANG, WENGUANG ZHU, University of Science and Technology of China — The search for a feasible design of graphene-based materials for spintronics applications has been intensified in recent years. Encouraged by recent experimental achievements, here we propose a new scheme to realize graphene-based spin field-effect transistors. The new design is constituted of a half-hydrogenated graphene nanoroad embedded in a fully-hydrogenated graphene. Using first-principles density function theory calculations, we demonstrate that such a design can convert non-magnetic pristine graphene into a bipolar ferromagnetic semiconductor. More importantly, the magnetism of such a nanoroad is very robust: independent of its width and orientation. We also discuss the stability of such nanoroads, as well as a simple design of an all-electric controlled device for generation and detection of a fully spin-polarized electric current.

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