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Dirac Half-Metal in a Triangular Ferrimagnet HIROAKI ISHIZUKA, YUKITOSHI MOTOME, Dept. of Appl. Phys., Univ. of Tokyo — Massless Dirac fermions show substantially different nature from ordinary electrons due to the peculiar cone-like dispersion with the point node. While it was originally introduced in the relativistic quantum theory, recent discovery of graphene, a single layer sheet of graphite, has carved out a new direction of their study in condensed matter systems. From the viewpoint of potential application to electronics, it is of great interest to control the electronic spin degree of freedom. However, there is not so much flexibility in graphene, as the relativistic spin-orbit interaction is very weak. Here, we present an alternative idea for realizing massless Dirac fermions in itinerant electrons coupled to a well-known ferrimagnet on a triangular lattice [1]. The Dirac fermions are spin-polarized, and stable in a wide range of the spin-charge coupling including typical values in solids. We demonstrate that, by an unbiased Monte Carlo simulation, such Dirac half-metal with ferrimagnetic order spontaneously emerges in a minimal Kondo-lattice type model. The realization will be beneficial for spintronics as a candidate for spin-current generator.

[1] H. Ishizuka and Y. Motome, preprint (arXiv:1210.6700), PRL in press.

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