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Even-dimensional topological semimetals under disorders X. J. HUANG, Y. X. ZHAO, Z. D. WANG, The Univ of Hong Kong — A topological theory of even-dimensional, chiral symmetry-preserving topological semimetal, which is known as the counterpart of Weyl semimetal, is developed in this work. We show that, in presence of disorder, an anisotropic topological θ-term emerges in the action of effective non-linear sigma model, meanwhile, an anisotropic Chern character term in terms of $U(1)$ gauge response theory, which gives the electromagnetic response, whose stability against disorders is ensured by the former topological ?-term, has also been derived. Moreover, it is found that this topological semimetal can be included in the family of topological quantum matter preserving chiral symmetry. The relations of this topological semimetal to odd-dimensional topological insulator and even-dimensional Dirac fermion are revealed in both effective non-linear sigma model and gauge theory. And importantly, above results can be applied to graphene if we set dimension $d = 2$ and thus reveal the topological character of this kind of 2-dimensional topological semimetal with two Dirac cones with opposite chiralities.

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