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Kitaev's honeycomb model on a buckyball[1] PAULA MELLADO, Adolfo Ibañez University, OLGA PETROVA, Max Planck Institute for the Physics of Complex Systems, OLEG TCHERNYSHYOV, Johns Hopkins University — We study the effect of disclinations in the Kitaev's honeycomb model [1] by examining the effective tight binding hamiltonian of Majorana fermions on Buckminsterfullerene [2]. Disclinations are realized by the 12 pentagons which shape the buckyball. We found that the ground state of the system with isotropic nearest neighbor coupling t_1, corresponds to a uniform flux sector of the Z_2 gauge field, where hexagons are flux free and pentagons have the same fluxes. Inclusion of second neighbor couplings t_2, preserve the projective symmetries of the truncated icosahedron as long as fluxes through all plaquettes (triangles, pentagons, and hexagons) related by symmetries are the same. For t_1/t_2 smaller than $1/2$, the local density of states reorganizes suggesting that the zero energy Majorana modes localize at the disclinations. The robustness of this quantum state against noise is examined.

[1] A. Kitaev, Ann. Phys. 321, 2 (2006).
[2] Kroto, Harold W., et al., Nature 318.6042 (1985).

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