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A Model for the Origin of Spin half Para-magnetism in Fluorinated Graphene PIALI ADITYA, ALEJANDRO SUAREZ, Pennsylvania State University, TYLER MAUNU, School of Physics & Astronomy, University of Minnesota, DIEGO B. CARRASCO, Engineering Physics Department, Universidad Iberoamericana A.C, JORGE SOFO, Pennsylvania State University — It came as a surprise when the Manchester group reported a paramagnetic response in fluorinated graphene [*Nair et al., Nature Physics 8, 199-202 (2012)*]. The response is characteristic of non-interacting spin 1/2 with a concentration that is almost zero up to 60% fluorination and peaks at 80% fluorination. The density is never larger than a few spins per 1000 carbon atoms. Prior DFT calculations show an absence of magnetism for dilute fluorinated graphene samples [*Sofo et al., Phys. Rev. B Rapid Comm. 83, 081411 (2011)*]. We propose that the magnetic response originates from regions with a small number of non-fluorinated carbon atoms surrounded by fluorinated ones. In support of this model we combine the exact response of the non-fluorinated regions with a stochastic model to account for the fluorination process. Our calculation reproduces the magnetic response of the samples and tracks the origin of this magnetic phenomenon to the grain boundary between fluorinated patches. If our model is correct, the number of spins in this sample is not an intrinsic quantity but is determined by the fluorination process.

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