Algumas propriedades do grafeno em meios dielétricos

Alessandra Nascimento Braga
Instituto de Estudos Costeiros, Universidade Federal do Pará

Jeferson Danilo Lima Silva
Campus Salinópolis, Universidade Federal do Pará

Wagner Pinheiro Pires
Programa de Ciências Exatas, Universidade Federal do Oeste do Pará and Faculdade de Física, Universidade Federal do Pará

Van Sérgio Alves and Danilo Teixeira Alves
Faculdade de Física, Universidade Federal do Pará

Eduardo Cantera Marino
Instituto de Física, Universidade Federal do Rio de Janeiro
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Twenty-five years ago, Marino proposed an effective and complete description in $2+1$ dimensions for electronic systems moving on a plane, but interacting as particles in $3+1$ dimensions, denominated pseudo-quantum electrodynamics (PQED) [Nucl. Phys. B **408**, 551 (1993)]. In the last years, PQED was successfully used to describe several graphene properties [Phys. Rev. X **5**, 011040 (2015); Phys. Rev. D **87**, 125002 (2013); **92**, 025018 (2015); **96**, 034005 (2017); Phys. Rev. B **95**, 245138 (2017)]. Recently, we used PQED to show that the well-known logarithmic renormalization of the Fermi velocity in a graphene sheet is inhibited by the presence of a conducting plate [Nucl. Phys. B **920** 221 (2017)] or a cavity of two conducting plates. Motivated by the physics of graphene, in the present work we use PQED to investigate the Fermi velocity renormalization in a graphene sheet surrounded by dielectric media. Incorporating the influence of the media into the gauge field, we obtain the correspondent photon propagator and the electron self-energy. We show that the Fermi velocity renormalization can be inhibited or enhanced depending on the relation among the dielectric constants of the media. This work was partially supported by CAPES, CNPq and FAPERJ. D. T. Alves was partially supported by CAPES via Programa Estágio Sênior no Exterior - Processo 88881.119705/2016-01, by CNPq via Processos 461826/2014-3 (Edital Universal) and 311920/2014-4 (Bolsa de Produtividade em Pesquisa). V. S. Alves acknowledges CNPq for support through Bolsa de Produtividade em Pesquisa n. 312654/2017-0.