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Graphene, a material for superfast electronics? ROBERT COURTNEY, SHYAM KATTEL, BORIS KIEFER, New Mexico State University — Physics Department, New Mexico State University: The performance of electronic devices has tremendously increased over the last few decades mainly due to miniaturization of electronic components. However, Moore's law suggests that a limiting minimal feature size of microprocessors may be reached as early as 2020. Thus, it is important to search for new technologies that allow overcoming this limitation. One possibility is to explore the feasibility of near speed of light electronics. Traditional metals have Fermi velocity on the order of 2000 km/s while the Fermi velocity of semiconductors is significantly lower. In contrast, the particular electronic structure of graphene may permit much faster electron transport than semiconductors and metals. This effect is due to the linear segments of the electronic dispersion in graphene below the Fermi energy, as opposed to the quadratic dispersion found in other materials. Here we have used density-functional-theory (DFT) to explore the effect of nitrogen doping on the electronic band structure of graphene, and especially its effect on the linear dispersion that is critical for near speed of light electronics.

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