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Electrical Transport Properties In Large Area Boron-Nitrogen-Carbon Layers BALEESWARAIAH MUCHHARLA, ARJUN PATHAK, Southern Illinois University Carbondale, ZHENG LIU, LI SONG, Rice University, THUSHARI JAYASEKERA, Southern Illinois University Carbondale, SWASTIK KAR, Northeastern University, ROBERT VAJTAI, Rice University, LUIS BALICAS, National High Magnetic Field Laboratory, Florida State University, PULICKEL M. AJAYAN, Rice University, SAIKAT TALAPATRA, NAUSHAD ALI, Southern Illinois University Carbondale — In this work, we present a detailed investigation of the temperature dependence of transport in thin layers of Boron Nitrogen and Carbon (BNC) and compare it with electrical transport in large area graphene. We find that the temperature dependence of resistance (5K $<$ T $<$ 400 K) of pure graphene shows a metallic behavior, whereas the BNC samples display an increasingly semiconducting behavior with increasing B and N concentrations. Density Functional Theory (DFT) calculations performed on pure graphene and BNC structures were in good agreement with this experimental observations. The observed temperature dependence of the electrical resistivity of BNC samples can be classified into two regimes. At higher temperatures (50K $<$ T $<$ 400 K), the BNC samples showed a band-gap dominated Arrhenius-like temperature dependence. At the lowest temperatures (5K $<$ T $<$ 50 K), the temperature dependence deviates from an activated behavior, and presents evidence for a conduction mechanism that is consistent with Mott's 2D-Variable Range Hopping (2D-VRH).

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