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**Figure 1**: Boron nitride-doped graphene characterization. (a) Low Energy Electron Microscopy characterization after the 8<sup>th</sup> growth cycle. Energy: 5 eV, size: 4  $\mu$ m. (b) Auger electron spectroscopy characterization performed after each of the growths cycles. HMB was introduced after the 3<sup>rd</sup> cycle. (c) Angle-Resolved Photoelectron Spectroscopy performed at a hv = 115 eV shows the band structure of boron nitride-doped graphene showing the lack of the Dirac cone, a clear indication of the presence of a bandgap.