Raman response of Graphite Intercalation Compounds revisited.

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We present a detailed in-situ Raman analysis of Stage I to VI potassium graphite intercalation compounds (GICs). In the case of Stage I (KC₈), an intrinsic and a defect modulated Raman response was observed [1]. We prove that the intrinsic G-line of KC₈ is at 1510 cm⁻¹, and it is strongly dependent on the actual defect content in the sample, which has important implications for the electron-phonon coupling responsible for superconductivity. From a comparison with Stage I CaC₆ and LiC₆, we highlight that the Raman active modes alone are not sufficient to explain the superconductivity within the electron-phonon coupling mechanism in CaC₆ and KC₈ [2]. The Raman response of Stage II (KC₂₄) is conformed by a single G-line at 1610 cm⁻¹, which is a useful benchmark for the identification of the intercalation stage in highly doped GICs. In the case of Stage III to VI, the G-line exhibit two components plus a single 2D-line. We demonstrate the presence of two nearest layer environments: heavily charged graphene layers adjacent to an intercalant layer and basically uncharged graphene layers sandwiched between other graphene layers electronically decoupled [3]. This allow us to unambiguously identify the Raman response of strained charged and uncharged graphene layers and to correlate it to the in-plane lattice constant determined by XRD, which for instance can be used to identify for internal induced strain in nanoelectronic and optoelectronic devices as well as the local interfacial strain in graphene polymer composites on an absolute value.

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