An SU(3) Yang-Mills Structure for Electron-Phonon Interactions in Graphene

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The Gell-Mann matrices are shown to map to spin and charge ordering phonon polarization vectors in three atom sub units of the two-dimensional graphene hexagonal sheets.

In a previous study[?] it was found that an SU(2) Yang-Mills description of electron-phonon interactions in linear systems such as vanadium dioxide can be developed by assuming that the transverse phonons couple to the electron spin via a Rasha-type mechanism. The SU(2) interaction vertex described there has many advantages over the standard U(1) approach to electron-phonon coupling. It contains both charge and spin-ordering and manifests at neighbouring atomic sites and therefore can describe phase transitions in which spin-odering is also present. In this work we repeat the same process, but we examine the SU(3) gauge group and find that it also describes charge and spin ordering in a low dimensional structure, however unlike linear systems as per SU(2) it describes hexagonal systems, such as graphene.

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