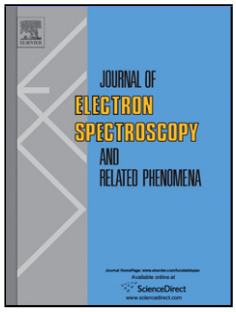

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Effects of Rhenium on graphene grown on SiC(0001)

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Highlight:

- the shift of 4f state in Re atoms on graphene is observed under elevated temperatures
- DFT calculation were performed in order to investigate the observed phenomenon
- calculations showed that the shift can be explained by the presence of defects
- vacancy has been chosen as the best candidate

Abstract: We study the effects of Rhenium (Re) deposited on epitaxial monolayer graphene grown on SiC(0001) and after subsequent annealing at different temperatures, by performing high resolution photoelectron spectroscopy (PES) and angle resolved photoelectron spectroscopy (ARPES). The graphene-Re system is found to be thermally stable. While no intercalation or chemical reaction of the Re is detected after deposition and subsequent annealing up to 1200°C, a gradual decrease in the binding energy of the Re 4f doublet is observed. We propose that a larger mobility of the Re atoms with increasing annealing temperature and hopping of Re atoms between different defective sites on the graphene sample could induce this decrease of Re 4f binding energy. This is corroborated by first principles density functional theory (DFT) calculations of the Re core-level binding energy shift. No