Single crystalline graphene synthesized by thermal annealing of humic acid over copper foils

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Abstract

Production of graphene by thermal annealing on copper foil substrates has been studied with different sources of carbon. The three carbon sources include humic acid derived from leonardite, graphenol, and activated charcoal. Hexagonal single crystalline graphene has been synthesized over the copper foil substrates by thermal annealing of humic acid, derived from leonardite, in argon and hydrogen atmosphere (Ar/H-2=20). The annealing temperature was varied between 1050 degrees C and 1100 degrees C at atmospheric pressure. Samples have been investigated using scanning electron microscope (SEM) and Raman spectroscopy. At lower temperatures the thermal annealing of the three carbon sources used in this study produces pristine graphene nanosheets which cover almost the whole substrate. However when the annealing temperature has been increased up to 1100 degrees C, hexagonal single crystalline graphene have been observed only in the case of the humic acid. Raman analysis showed the existence of 2D band around 2690 cm(-1). Published by Elsevier B.V.

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