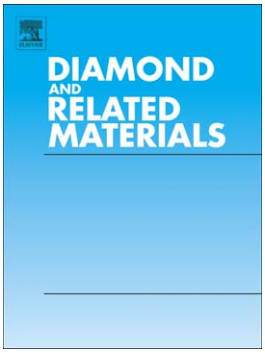

Influence of plasma process on the nitrogen configuration in graphene

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Influence of plasma process on the nitrogen configuration in graphene

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Abstract

We investigated nitrogen doping into graphene on copper substrates by plasma treatment and by plasma immersion ion implantation (PIII). Two nitrogen bonding configurations were discovered to be dominant for distinct plasma processes. Pyridinic-N (P1) was the preferential N-bonding for doping with PIII while it was pyrrolic-N (P2) for plasma treatment. The ratio of pyrrolic-N and pyridinic-N bonding (P2/P1) in N-doped graphene obtained from our experiments was associated with the simulated ratio of divacancy and monovacancy defect. Vacancy defect species induced by plasma in graphene play a key role to determine preferential N-bonding. Energetic nitrogen ions can stimulate the conversion of pyrrolic-N to pyridinic-N bonding via thermal spike, which leads to the decrease of the P2/P1 ratios when exposing graphene to nitrogen ions by either prolonging implantation or increasing implantation energy.