Nitrogen doping of graphene oxide: the role of ammonia

Gerard Tobias (1), Stefania Sandoval (1), Nitesh Kumar (2), A.Sundaresan (2), C.N.R. Rao (2), Amparo Fuertes (1)

(1) Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Campus UAB, Bellaterra
(2) Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India
gerard.tobias@icmab.es

Abstract
Recently, graphene is attracting wide-ranging interest due to its unique properties and promising applications in electronic devices and sensors. Doping is an efficient way to tailor its electronic and magnetic properties and can also be used to modify the local chemical activity of graphene for further chemical functionalization or modification. In this work, we have studied the nitrogen doping process by treatment in gaseous ammonia of graphene oxide samples using different conditions of time, temperature and flow rate. Following this approach N-doped reduced graphene oxide (N-doped RGO) samples have been obtained. The presence of nitrogen within the structure of RGO induces a remarkable increase in the thermal stability against oxidation by air. The thermal stability is closely related with the temperature of synthesis and the nitrogen content. The combustion reaction of nitrogen in different coordination environments is analyzed against a graphene fragment (undoped) from a thermodynamic point of view. In agreement with the experimental observations, the combustion of undoped graphene turns out to be more spontaneous than when nitrogen atoms are present [1]. Analysis of the samples by a variety of complementary techniques confirms the presence of N-bearing functionalities. An efficient N-doping (pyridinic, pyrrolic and graphitic N), up to 13 wt.%, is achieved at high temperatures [2].

References

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