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Synthesis of graphene films in the combined flame

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This paper presents results of a study of the synthesis of graphene on the surface of a nickel substrate in an alternate flame of benzene with ethanol at atmospheric pressure. The main advantage of the proposed method is that the process of graphene formation in a flame occurs within 10^{-5} to 10^{-3} sec. Comparative studies by several authors [1, 2] confirm that the process of graphene receiving in flame can successfully compete with the process of synthesis by chemical vapor deposition (CVD) method [3]. In work [4], presented results on the investigation of the synthesis of graphene layers in a double flame at atmospheric pressure. The size of the resulting graphene domains lies within the range of 10^{-15} μm [4]. In the proposed work, the synthesis of graphene was carried out under the following conditions: the consumption of benzene was 80 cm^3/min, the consumption of ethanol 190 cm^3/min, the formation of graphene took place in the flame zone with a temperature of 950-970 °C. A nickel plate with a thickness of 0.2 mm was used as the substrate, which was installed vertically in the middle of the flame. Formation of graphene took place within 30-60 sec. The obtained samples were examined on a Raman spectroscope (NTEGRA Spectra Raman. Graphene identification done by three peaks: the first peak D at 1351 cm^{-1}, the second peak G at 1580 cm^{-1} and the third peak 2D at 2700 cm^{-1}. By correlation of G peak (IG) and 2D peak (I2D) the number of graphene layers (IG/I2D) was evaluated, and by correlation of intensity D peak (ID) and G peak (IG) the degree of graphene (ID/IG) imperfection was estimated. Under feeding of ethanol to the center of the flame on the substrate forms 5-10 layers of graphene (IG/I2D = 1.8, ID/IG = 0.48).

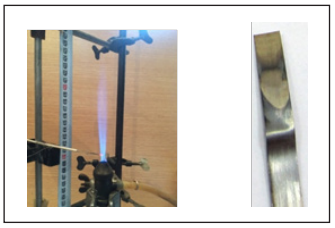

Illustration of the burner and a photograph showing the formation zone of graphenes on a nickel substrate

Recent Publications (If any)

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Biography

Danara Nurgozhina is master's degree. Scientific interests: chemical physic, nanotechnology, science dealing with combustion.

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