

Nanocomposites and nanomaterials

Some aspects of CNTs synthesis by products of natural gas conversion on the fresh-reduced iron

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The mechanism of carbon nanomaterial formation at moderate temperatures while processing of fresh-reduced iron by products of air conversion of natural gas is considered. It is shown that under given conditions the size and the shape of the resulting carbon are depended on the temperature and the size of microscopic iron grains formed during reduction. These iron grains are the catalyzer of the reaction of carbon monoxide disproportionation. It is concluded that the formation of nucleus of the new carbon phase occurs at the contact boundaries of neighboring grains of newly reduced iron with the subsequent formation in these places of ring-shaped carbon cups. Nanotubes are forming as a result of further carbon crystallization and separation of iron particles from the main mass is occurring i.e., there is a fragmentation of the substance of the catalyst. According to the results of laboratory studies the optimum temperature of carbon nanotubes formation in the environment of converted gas is 600 – 650°C. The evidence of the hypothesis that the mechanism of the reaction of carbon monoxide disproportionation flows through the intermediate stage of iron oxides formation is given.



Fig. 1. (a) – Scheme of carbon cup formation on the edge of contact of grains of the catalyst b) – Scheme of nanotubes growth after iron particle separation from the main part of the catalyst.