ROLE OF VIBRATIONS AND JET EMISSION IN THE SYNTHESIS OF CARBON NANOPARTICLES BY SUBMERGED ARC DISCHARGE.

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Few studies have been devoted to explaining the growth of carbon nanoparticles in submerged arc discharge in liquids. All of them considered that the arc discharge generates a carbon-supersaturated vapor that in its fast expansion form droplets. These models are based on two premises: a) the electrical and temperature fields are stationary; b) the carbon vapors nucleation process is homogeneous. These models cannot explain the presence of other complex structures observed and do not disclose the processes leading to the appearance of impurities. The present experimental results evidence the presence of vibration and emission of jets in the submerged arc discharge process. The existence of vibration and emission of jets contradicts the basic of existing models. The study of these effects allows clarify the presence of nanostructures and contaminants that cannot be explain by the existent models. Taking into account these effects, it is possible to improve the synthesis facilities design. In particular, it is very important that the system owns an electric stabilization element because mechanical devices are not fast enough to fast adjust the arc gap between submerged electrodes in order to compensate the arc current fluctuations. This would allow a better purity and the desired structure of the products.

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