Abstract Submitted
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Carbon nanoparticles in the radiation field of the stationary arc discharge[1] MIKHAIL SHNEIDER, Princeton University — The arc discharge between the graphite electrodes burning in the high pressure atmosphere of inert gases is one of the standard methods of nanoparticle synthesis. The arc is a very powerful light emission source, which is close to the blackbody source. We present a simple theoretical model of heating the spherical carbon nanoparticles in the Rayleigh regime of the radiation absorption, depending on their size and the parameters of the radiating arc and the surrounding gas. We consider the conditions specific to the far periphery of the arc, where the degree of ionization is very small and the plasma effects in the heat balance are negligible. The following cooling processes are taken into account: radiative cooling; conductive cooling in collisions with the buffer gas atoms, and thermionic emission. The obtained results show that the nanoparticles temperatures significantly exceed the local temperature of the buffer gas. A quasi equilibrium temperature of the particle is higher the closer this particle is to the arc. The particle temperature is established within 10 microseconds. For this time the convective displacement of the particles is negligible. The heating of nanoparticles by the radiation can affect the process of synthesis. The degree of heating of the particle is determined by the particle's geometry, and this opens additional possibilities for nonintrusive optical diagnostics.

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