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Effect of electron energy distribution function on formation of graphene nanocrystallites during electron-irradiation-induced carbon film growth process in an ECR Plasma[1] WENCONG CHEN, XI ZHANG, DONGFENG DIAO, Shenzhen University, INSTITUTE OF NANOSURFACE SCIENCE AND ENGINEERING TEAM — Recently, a low-energy electron irradiation technique was developed to deposit graphene-nanocrystallites-embedded carbon (GNEC) films which manifests unique tribological, magnetic and optoelectronic properties. However, the role played by low-energy electrons in this process remains unclear. During the electron irradiation process, substrates are positively biased and electrons produced in the plasma are accelerated to irradiate the deposited GNEC films. In this work, electron energy distribution function on the substrate surface during the electron-irradiation-induced carbon film growth process in an ECR (Electron Cyclotron Resonance) plasma is measured with a retarding field energy analyzer (RFEA). The deposition temperature is probed by an infrared thermometer. A Langmuir probe is used to monitor the plasma potential and calibrate the current sensitivity of the RFEA. It is found that the size and concentration of graphene nanocrystallites strongly depend on the irradiation electron energy and the electron flux but not the temperature, which indicates that the electron excitation effect of the covalent bonds dominate the formation process of these nanocrystallites. This finding sheds light on the interaction between the plasma and carbon materials.

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