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Early stages of the chemical vapor deposition of pyrolytic carbon investigated by atomic force microscopy

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Abstract

The early stages of chemical vapor deposition of pyrolytic carbon on planar silicon substrates were studied by the atomic force microscopy-based technique of chemical contrast imaging. Short deposition times were chosen to focus on the early stages of the deposition process, and three different types of nucleation were found: random nucleation of single islands, nucleation of carbon islands along lines and secondary nucleation which corresponds to the nucleation of carbon islands at the edges of already existing carbon islands. The transition from individual carbon islands to a complete carbon film was observed with increasing residence time.