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Plasma processing for carbon nanostructures

Carbon nanostructures, namely, graphene-based materials such as carbon nanotube and graphene itself have attracted much attention due to their outstanding properties as well as emerging applications. For the synthesis of diamond and amorphous carbon films, graphene-based materials can be synthesized by several plasma enhanced chemical vapor deposition (PECVD) techniques on heated substrates (600-800 °C) employing methane and hydrogen mixtures. For example, plane graphene formation can be realized by PECVD on Ni substrate in the remote plasma configuration at relatively low temperatures (~650 °C). In fact, excess flux of carbon precursors causes supersaturation and ion bombardment induces the nucleation of nanographene, resulting in the formation of vertical nanographene (carbon nanowall, CNW). CNWs are few-layer graphenes standing vertically on a substrate to form a self-supported network of wall structures. The maze-like architecture of CNWs with large-surface-area graphene planes would be useful as electrodes for energy devices, electrochemical and biosensors. Morphology including structure and crystallinity as well as electrical properties of carbon nanostructures should be controlled according to their applications. Plasma processing has a significant role in fabricating carbon-based materials and achieving their practical use in many areas. We report the current status of the synthesis of plane graphene and vertical graphene using PECVD, and focus on the control of the CNW structures during the growth processes as well as post treatment to be used as platform of the electrochemical and bio applications.

Biography

Mineo Hiramatsu is a full professor in Department of Electrical and Electronic Engineering and the Director of Research Institute, Meijo University, Japan. He served as the Director of The Japan Society of Applied Physics. His main fields of research are plasma diagnostics and plasma processing for the synthesis of thin films and nanostructured materials. He is an Author of more than 100 scientific papers and Member of organizing and scientific committees of international conferences on plasma chemistry and plasma processing. He is the Fellow of Japan Society of Applied Physics.

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