Abstract Submitted
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Synthesis of few-layer graphene using microwave-exited atmospheric pressure plasma MINEO HIRAMATSU, KOKI MIYASHITA, TAISHU OYAMA, KEIGO TAKEDA, Meijo University, HIROKI KONDO, MASARU HORI, Nagoya University — Graphene-based materials can be synthesized by several plasma enhanced chemical vapor deposition techniques. However, ion bombardment induces the defects. In this work, microwave-excited atmospheric pressure plasma [1] was applied to the synthesis of few-layer graphene on Cu substrate. The effect of ion bombardment on the growing surface can be removed due to the high-pressure operation. The microwave (2.45 GHz) propagates from the top of the deposition chamber to the 60-mm-long micro-gap electrode, and slit-shaped plasma is produced. Slit separation of micro-gap electrode is 0.2 mm. The distance between the micro-gap electrode and Cu substrate is 5 mm. Growth experiments were carried out for 30 to 300 sec on heated (˜700C) Cu substrate employing He/H2/CH4 mixture at atmospheric pressure. Raman spectrum of graphene-based film formed for 300 sec was almost identical to that of the film formed for 30 sec, indicating that the number of graphene layers did not increase in spite of the increase of formation period. Despite the localized plasma shape, graphene was formed uniformly on the whole substrate (5 cm diameter in the present case). Results indicated that the self-limiting growth of graphene could be attained on the Cu substrate by supplying long-lived hydrocarbon radicals without ion bombardment using atmospheric pressure plasma. [1] A. Matsushita, et al., Jpn. J. Appl. Phys. 43, 424 (2004).

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