Fabrication of carbon films using microwave plasma-enhanced CVD in surface wave mode

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Previously, we have grown graphene-based films on the Cu substrate using microwave plasma enhanced CVD (MWPCVD). In this work, graphene-based films were grown on the Ni-coated SiO2 substrate using MWPCVD in surface wave mode employing CH4/H2 mixture at a temperature of 850 °C. Ni-catalyst layer was prepared on the SiO2 substrate by arc plasma deposition. After the termination of plasma, the substrate was cooled to room temperature at a cooling rate of 15 °C/min. Figure 1 shows Raman spectra of carbon films formed on Ni-coated SiO2 substrate for 1, 5, and 10 min. The position and shape of the 2D band peak around 2700 cm⁻¹ are known to distinguish the number of graphene layers. Moreover, the intensity ratio of the 2D to G band peaks (I₂D/I₆) has a good correlation with the number of graphene layers [1]. In our case, as the growth period decreased, the 2D band peak intensity increased. In the Raman spectrum of the film grown for 1min, the 2D band peak became sharp and its intensity increased, indicating the successful synthesis of a few-layer (>3) graphene sheet in the short period of 1 min on the Ni-coated SiO2 substrate.


Fig. 1 Raman spectra of carbon films grown on Ni-coated SiO2 substrate for 1, 5, and 10 min.