

Characteristics of Diamond Thin Film under MPECVD system

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Diamond thin films were deposited on Si substrate by MPECVD technique. The quality of the films has been investigated as a function of total pressure and microwave power. As the total pressure and microwave power increase, the film quality has been enhanced. The film quality is found to be closely associated with the variation of gas components in the plasma. The film morphology was examined as a function of total pressure and nucleation density. As the increase of the total pressure, the film morphology changed such as cauliflower-like \rightarrow $\{111\}$ \rightarrow $\{100\}$. This change is understood to be related to the substrate temperature. At high nucleation density, the thin films consist of the well-faceted grains for all the deposition time. Low nucleation density leads to cauliflower-like morphology for the initial deposition time, but the cauliflower-like morphology develops into the well-faceted $\{100\}$ grain shape with increasing the deposition time. This result strongly indicates that the higher nucleation density reduces the developing time into the well-faceted diamond grains.