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MWPCVD에 의해 합성된 다이아몬드 박막 특성에 대한 증착조건의 영향

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In this thesis, the metastable state diamond thin films have been deposited on Si substrates from methane-hydrogen and oxygen mixture using Microwave Plasma Enhanced Chemical Vapor Deposition (MWPCVD) method. Effects of each experimental parameters of MWPCVD including methane concentrations, oxygen additions, operating pressure, deposition time, etc. on the growth rate and crystallinity were investigated. SEM, XRD, and Raman spectroscopy were employed to analyze the growth rate and morphology, crystallinity and prefered growth direction, and relative amounts of diamond and non-diamond phases respectively.

As a methane concentration below 4%, the deposited films having well-defined facets could be obtained. As the methane concentration increases over 4%, the shape of films gradually changed into a amorphos form. The best crystallinity of the film at 3% in the Raman spectroscopy.

Addition of oxygen to the methane-hydrogen mixture gave an improved film crystallinity at 50% oxygen concentration due to its more effectiveness in the selective removal of the non-diamond phased compared to the of H atom. on the contrary, the growth rate generally decreased by oxygen to from the more stable CO and CO_2 is responsible for such an effect.

Upon increasing the operating pressure and time, increased of growth rate and crystallinity were increased simultaneously