

Emission Sites on Diamond-Like Carbon Films Studied by Scanning Anode

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We deposited diamond-like carbon(DLC) films by ion beam sputtering on a flat substrate for use as a thin film field emitter. N-type silicon, titanium-coated silicon, and indium tin oxide(ITO)-coated glasses were used as a substrate. Field emission measurement was performed in 3×10^{-7} Torr vacuum. The films hardly exhibited emission before a breakdown occurred at high voltage. To study the role of breakdown, we measured local emission by scanning the surface with a tip anode. The result showed that most emission was contributed from the sites melted and deformed by breakdown. Further analysis of the deformed sites were done by scanning Auger spectroscopy, micro Raman spectroscopy, and scanning-electric field microscopy. Formation of SiC and local field enhancement due to morphology change confirmed from these measurements.

We found lots of current from breakdown sites. For analyzing breakdown sites characteristics, we used field emission scanning electron microscopy, Auger electron spectroscopy and Raman spectroscopy. So we suggest reason why emitting from breakdown sites.