

**Electrochemical Surface-Hydrogenation and  
Characterization of Nitrogen-doped N-Type  
Nanocrystalline Diamond Film**

**Ying Xiong\*, Bing Wang, Jing Li, Rufang Peng, Bo  
Jin, Hongbo Li**

*State Key Laboratory Cultivation Base for Nonmetal  
Composites and Functional Materials, Southwest  
University of Science and Technology  
Mianyang, 621010 P. R. China*

In this article, nitrogen-doped N-type nanocrystalline diamond thin film was successfully hydrogenated in surface via a mild electrochemical cathode polarization in the acidic solution. The change of surface- and micro-structure of nitrogen-doped N-type nanocrystalline diamond thin film before and after the treatment of electrochemical cathode polarization were carefully investigated by X-ray photoelectron spectrum (XPS), capacitance-voltage analysis, Raman spectrum and scanning electron microscopy (SEM). These results suggested that this electrochemical cathode polarization technique could not only obtain high-density hydrogen-terminated surface, but also had not significant effect on micro-structure of diamond thin film, especially on  $sp^2$ -hybridized carbon located in grain boundary, indicating that this technique is an effective and undamaged surface-hydrogenation method for nitrogen-doped N-type nanocrystalline diamond thin film.