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## Controlling the surface energy and electrical properties of carbon films deposited using unbalanced facing target magnetron sputtering plasmas

Amjed Javid<sup>1</sup>, Manish Kumar<sup>1</sup>, Seok Young Yoon<sup>2</sup>, Jung Heon Lee<sup>2</sup> and Jeon Geon Han<sup>1,3</sup>

<sup>1</sup>NU-SKKU Joint Institute for Plasma Nano-Materials (IPNM), Center for Advanced Plasma Surface Technology (CAPST), Advanced Materials Science and Engineering, Sungkyunkwan University, Suwon, 440-746

<sup>2</sup>Biological & Nanoscale Materials Lab, Advanced Materials Science and Engineering, Sungkyunkwan University, Suwon, 440-746, Korea.

<sup>3</sup>Department of Industrial Engineering, Faculty of Engineering, Chiang Mai University, Chiang Mai-50200, Thailand.

Surface energy, being an important material parameter to control its interactions with the other surfaces plays a key role in bio-related application. Carbon films are found very promising due to their characteristics such as wear and corrosion resistant, high hardness, inert, low resistivity and biocompatibility. The present work deals with the deposition of carbon films using unbalanced facing target magnetron sputtering technique. The discharge characteristics were studied using optical emission spectroscopy and correlated with the film properties. Surface energy was investigated through contact angle measurement. The ID/IG ratio as calculated from Raman spectroscopy data increases with the increase in power density due to the higher number of sp<sup>2</sup> clusters embedded in the amorphous matrix. The deposited films were smooth and homogeneous as observed by Atomic force microscopy having RMS roughness in the range of 1.74 to 2.25 nm. It is observed that electrical resistivity and surface energy varies in direct proportionality with operating pressure and has inverse relation with power density. The surface energy results clearly exhibited that these films can have promising applications in cell cultivation.

**Keywords:** surface energy, resistivity, cell cultivation

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## 수직 이중 층이 도입된 나노갭 소자를 이용한 금나노입자 검출

배진영, 이초연, 박대근, 김수현, 표한나, 윤완수\*

성균관대학교 화학과

본 연구에서는 나노갭 소자에 미세유체 수직 이중층을 도입하여 상층에 존재하는 금나노입자를 검출하였다. 형성된 수직 이중 층의 상층에는 검출물질을 주입하였고 하층에는 검출물질과 소자 표면의 전극을 분리시킬 수 있는 용액을 주입하였다. 수직 이중층의 형성은 크로노암페로메트리(Chronoamperometry)를 이용하여 상층에 흘려준 electrochemical indicator 인 ferricyanide 용액의 전기화학 신호가 발생되지 않음을 통해서 확인하였다. 연속적인 수직 이중 층의 흐름에서 유전영동법을 이용하여 상층에 존재하는 금나노입자들을 나노갭전극으로 유도포획 하였고 이때 실시간으로 변하는 전류 값으로부터 금나노입자의 검출여부를 판단하였다.

**Keywords:** 수직 이중층, 나노갭 소자, 금나노입자 검출, 유전영동