

CAPST and Plasma-Nano Process for Design and Synthesis of Functional Films for Emerging Industries

Jeon G. Han

Center for Advanced Plasma Surface Technology

Sungkyunkwan University, 300 Chunchun-dong Jangan-gu,

Suwon, Korea 440-746

hanjg@skku.edu

Abstract

Plasma-nano process for functional film synthesis and surface treatment becomes crucial in development of next generation industrial film materials and devices of unique properties. The prime issue in plasma-nano process development is the control of plasma parameters, chemistry of film materials and surface temperature during film nucleation and growth contributing microstructure and related film properties. The profile and activity of CAPST will be briefly introduced. The fundamental and application of plasma-nano process is then discussed on the design and synthesis of new functional films in terms of material chemistry and plasma parameters performed in CAPST. The evolution of microstructure including nucleation and growth behavior of a few functional metal and compounds films is illustrated at various plasma conditions by modulating plasma parameters. The surface temperature evolution as one of key controlling parameter is designed by theoretical modeling in terms of plasma parameters including particle flux and energy and compared with empirical data measured by in-situ monitoring of film surface temperature with specified IR measurement system at various pulsed power input conditions. The modulation of film microstructure is then achieved by control of chemistry of film materials and plasma parameters, which are illustrated with integrated diagnostics data measured by Langmuir probe, nano-second time resolved optical emission spectroscopy and laser absorption spectroscopy.

Finally recent achievement of CAPST will be discussed in field of emerging industries.