Correlation between nanoparticle growth and plasma parameters in low pressure reactive VHF discharge plasmas

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We report experimental results on correlation between nanoparticle growth and plasma parameters in capacitively-coupled VHF discharges with amplitude modulation (AM) obtained using two dimensional laser light scattering method [1-3]. AM gives an artificial plasma fluctuation, which brings about 100% increase of density of nanoparticles, 23% decrease of their size, and narrower size dispersion. The growth of nanoparticles shows strong correlations with ion-saturation current (Fig. 1) as well as optical emission intensities of plasmas at the modulation frequency of 500Hz and its second harmonics. These correlations are not explained by transport of nanoparticles. Coupling between growth rate of nanoparticles and flux of radicals to the nanoparticles can be the key to the correlations.


Fig. 1. Cross coherence between LLS and ion saturation current for 500 Hz modulation.