# Nanocomposite metal/plasma polymer films prepared by means of gas aggregation cluster source

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Nanocomposite metal /plasma polymer films have been usually prepared by simultaneous plasma polymerization and co-sputtering or evaporation of metal [1]. In this case the both: activated and intact monomer molecules arrive to the substrate simultaneously with metal atoms. The former ones create plasma polymer component of the nanocomposite while metal atoms try to group into metallic inclusions with the size depending on the substrate temperature. The other way is to incorporate already fabricated clusters into the growing plasma polymer matrix. This has been achieved by a type of gas aggregation source using metal evaporation [2]. In our case we designed a gas aggregation cluster source that uses a planar magnetron in a compact and simple form. With this source we prepared Au and Ag clusters incorporated into C:H plasma polymer.

The source operates with the circular magnetron equipped with 80 mm target. Gas aggregation chamber is attached to the housing of the magnetron and is water cooled. All this set-up is mounted on ISO-K 100 mm flange. The performance of the source is described. At moderate working parameters - Ar flow 3 ccm/min, presure 50 Pa, planar magnetron 80 mm in diameter with Ag target, Magnetron current 200 mA, magnetron voltage 300 V we received clusters up to 30 nm in diameter.Because of source simplicity we have no mass separation and therefore the cluster size distribution is broad, however, cluster flux is sufficiently intensive.

This cluster source was built in the vacuum deposition system (pumped by diffusion and rotary pumps) in opposite to another magnetron having graphite target 90 mm in DIA and with the substrates rotating in between these two. Introducing small amount of n-hexane (flow rate 0.5 ccm/min) into the vacuum chamber allowed to create a flux of plasma polymer precursors reaching the substrate. As a result a C:H plasma polymer with incorporated Ag clusters was prepared. The prepared films were characterized by TEM, SEM, XPS, FTIR and AFM. Optical properties were measured

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[2] Ryszard Lamber, Stefan Wetjen, and Giinter Schulz-Emoff, Alfred Baalmann, *J. Phys. Chem.* 1995,99, 13834–13838.