Nanoparticles and nanostructures: from preparation towards (bio)application

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Gas aggregated nanoparticles, produced by nucleation of supersaturated atomic metal vapours, represents and eligible approach for deposition of tailored nanostructured surfaces. Nanoparticles, grown in a low temperature plasma volume, dispose unique properties as narrow distribution function, high purity grade, controlled size growth etc. Together with the fact that nanoparticles are deposited as a beam flux streaming towards the substrate, makes this technique flexible for preparation of advanced and functional surfaces. The contribution aims at nanoparticle formation and defined deposition of nanostructured, 2D-graded multicomponent films. Graded nanoparticle surfaces represent structures with high added value. For deposition of highly defined 2D-graded, two-metal nanoparticle-based surfaces we used to employ an analytical model which allows us to precisely control (*i*) nanoparticle volume surface density, i.e. the volume of nanoparticles deposited onto a unit surface area, and (*ii*) chemical composition ratio across the surface (*x*,*y*). The relevance of the proposed method is demonstrated on 2D-graded Ag-Cu nanocomposite film with tunable plasmonic (absorbance) features.

The application potential will be demonstrated on antibacterial nanocomposites with metal ion and antibiotics synergic action. Furthermore, tailored surfaces for nanoparticles-assisted laser desorption ionization mass spectrometry (NPs-LDI-MS) with excellent reproducibility and possibility to detect low-molecular-mass agents will be presented, too.

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