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NANOSTRUCTURED COATINGS ON LARGE SURFACES

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We present here an original safe-by-design method for the elaboration of nanostructured films composed of nanoparticles embedded in a matrix. This versatile single step process operates under vacuum by combining the jet of nanoparticles technology with classical magnetron sputtering. It is then possible to choose independently the chemical nature of nanoparticles and matrix. Moreover, it is possible to use any source of nanoparticles in the gas phase. For example, nanoparticles can be synthesized *in-situ* by laser driven pyrolysis [1]. An atomizer that produces aerosol from colloidal suspension of previously synthesized nanoparticles can also be used. After the achievement of the proof of concept with a laboratory apparatus, we have developed a new prototype for synthesizing homogenous nanocomposites thin film on surfaces that are large enough to match industrial needs. The general scheme of the apparatus is presented in Fig. 1. The ability to achieve synthesis on large surfaces is provided by the use of a series of four aerodynamic lenses implemented on the prototype set up between the source of nanoparticles and the deposition chamber. The lenses are composed of successive chambers separated by diaphragms usually used to produce collimated beam of nanoparticles [2]. Numerical and experimental studies show that is possible to obtain a divergent and homogenous jet of nanoparticles by adapting the geometry of the lenses. The ability to elaborate large and homogenous nanostructured films were investigated with different types of nanoaerosols of different sizes and densities. Films can be characterized *in situ* by FUV fast acquisition Spectroscopic Ellipsometer from HORIBA. Samples composed of gold nanoparticles in a silica matrix will be shown. Many applications are already considered for this type of coatings, including photocatalysis, photovoltaic solar cells, aesthetic coatings for luxury industry, hard covering for tools or self-healing films. This work is currently supported by the French National Research Agency (ANR) under contract N° ANR-14-CE07-0036.

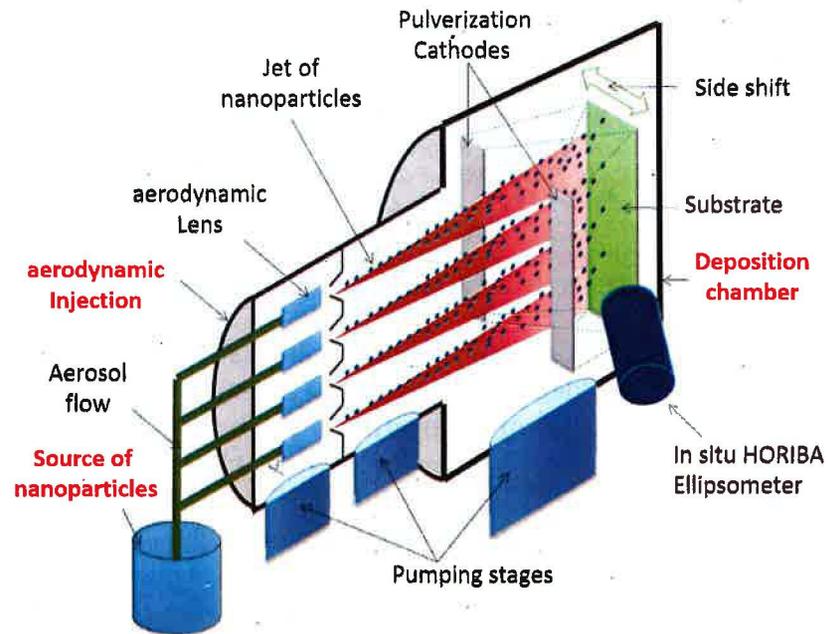


Fig. 1: General scheme of the co-deposition prototype for large-surfaces.

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