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Titanium oxide particles obtained using an argon RF atmospheric plasma jet

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Metallic particles, of nano or micrometer size, have been intensively studied due to their outstanding properties and their broad range of applications. As a consequence, a wide variety of particle generation methods were reported. This is due to the fact that controlling the synthesis process one can tailor specific particle's properties, namely size, shape, composition, surface area, etc. As metallic source for particles generation one may use either gas, liquid or solid.
In our study titanium particles were obtained using a radio-frequency (RF) plasma jet that operates at atmospheric pressure. It must be mentioned that the plasma jet works in inert gaseous atmosphere (argon) and expands from an initiation discharge chamber into a deposition chamber. The metal source was represented by the RF powered electrode, hence we used titanium solid bulk material as a precursor.
Energy Dispersive X-ray Spectroscopy (EDS) investigations show that titanium oxide particles were obtained. Optical and Scanning Electron Microscopy (SEM) analyses reveal that spherical nano and micro-particles were deposited. The nano-particles form a continuum thin film and have a diameter in the range of 20 up to 50 nm, whereas the micro-particles have 1 up to 3 μm. The particle's structure, as investigated by Transmission Electron Microscopy (TEM), point out that the all the obtained micro-particles have a surface oxide layer. However, the size and structure of the particles is influenced by the plasma particularities and the particle's characteristics depend on the appropriate plasma parameters (temperature, species, etc).
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