In situ investigation of nanoparticles synthesis processes

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Nanoparticles are an important issue of the nanoscience nowadays. The understanding of the growth and nucleation processes is fundamental since these mechanisms determine the optical, electronic, magnetic and catalytic proprieties of the nanoparticles. In this work we investigated the growth and nucleation process of metallic nanoparticles and mesoporous silica matrices during the synthesis process using Small Angle X-Rays Scattering (SAXS) in situ measurements. As will be shown, a special experimental setup was developed for a laboratory based SAXS system, allowing a detailed and controlled investigation of the process. The results from in situ measurements are further supported by nitrogen absorption, powder diffraction, transmission electron microscopy (TEM), scanning electron microscopy (SEM), dynamic light scattering among many other techniques in order to obtain a detailed description of the system. The in situ SAXS data were analyzed using advanced models, which allows a detailed monitoring of the structural parameters during the synthesis routes. Several examples of application will be shown as metallic (gold, silver, platinum, etc) nanoparticles, ordered mesoporous silica matrices among other examples, demonstrating the potential of this procedure.


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