# Development of inorganic nanoparticles for multimodal imaging applications

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In recent years, nanotechnology has made possible the development of new contrast agents with increasingly exceptional performance. In this regard, inorganic nanoparticles are one of the most studied materials thanks to the unique physicochemical properties that depend on their nanoscale dimensions.
Various synthetic approaches have been proposed for the preparation of inorganic nanoparticles with different compositions and sizes, which can be tailored according to their applications, such as solid tumor diagnosis, imaging, drug delivery and theranostics. In addition, their surfaces can be functionalized with biomolecules or polymers to improve pharmacokinetics and biodistribution, thereby increasing diagnostic efficiency and effective drug delivery by reducing adverse side effects associated with nonspecific delivery, as well as increasing drug concentration at the desired site of action. [1,2]
An accurate diagnosis is the first vital procedure to effectively improve disease outcome, and it largely depends on the development of imaging technology. In this field, there has been enormous interest in the development of new tools for multimodal molecular imaging, which combines different techniques to assess anatomical and physiological processes in vivo. [1]
Different imaging modalities, such as magnetic resonance imaging (MRI), computed tomography (CT), fluorescence imaging (FLI), nuclear medical imaging (PET, SPECT), and photoacoustic imaging (PAI), can provide anatomical and spatial information about site and progression stage of pathologies. Within this frame inorganic nanomaterials, thanks to their adjustable compositional and physicochemical characteristics, enable detailed cellular and molecular characterization. [2,3]

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