414f Tricalcium Phosphate and Fluoroapatite Nanoparticles for Medical Implants

Tobias J. Brunner, Loher Stefan, and Wendelin J. Stark

Bone repair and regeneration of defects arising from trauma, tumor or bone diseases display a complex and serious clinical problem in orthopedic surgery, but most importantly pain and often immobilization of the patient. Bone substitute materials, in particular calcium phosphate compounds, have gained great importance in the field of biomaterials due to their positive *in vivo* responses including biocompatibility, bioactivity and osteoconductivity.

The currently used wet chemical preparation methods result in a series of very successful products but the inherently low preparation temperature still limits the range of accessible materials and morphologies. We have therefore modified an existing flame spray process for the synthesis of oxide nanoparticles and now propose a route to complex salt nanoparticles which largely extends the range of available nanoparticulate materials.

More specifically, we continuously prepared calcium phosphates with different Ca/P ratios from 1.43 to 1.67 and optional doping with biologically relevant ions such as Zn or Mg. As-prepared powders consist of amorphous nanoparticles with a primary particle size of 10-30 nm having a specific surface area of about 90 m^2g^{-1}. Sintering results in **phase-pure** β-tricalcium phosphate and hydroxyapatite as confirmed by Fourier transform IR. Addition of a fluorine containing precursor gives access to fluoroapatites. The high degree of flexibility in morphology, crystallinity and phase composition offer a versatile fabrication tool to biomaterials engineering for prefabricated implants, injectable cements, coatings and drug delivery.

References: Loher, S. et al., Fluoro-apatite and calcium phosphate nanoparticles by flame synthesis. *Chemistry of Materials* **17**, 36-42 (2005). Huber, M. et al. Flame synthesis of calcium carbonate nanoparticles. *Chemical Communications*, 648-650 (2005).

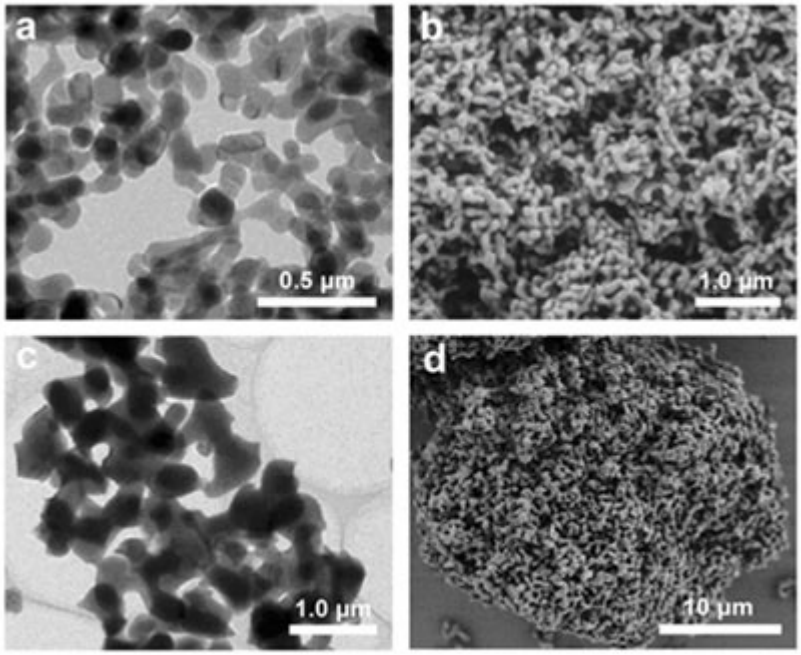

Fig 1. TEM (left) and SEM (right) images of tricalcium phosphate.