Biomimetic and bioactive bone templating materials and additives to bone cement based on magnesium and calcium phosphonates

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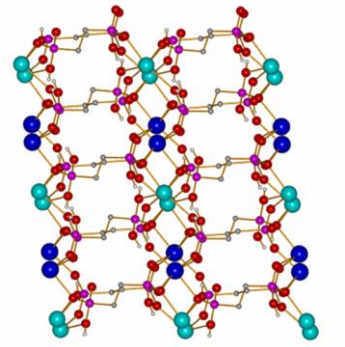
A collaborative project, based on the combined expertise in the preparation of microporous alkaline earth metal phosphonates (KR) and PMMA based bone cement (JH) will yield novel biomimetic materials with wide ranging applications in the biomedical field. Synthetic work as well as characterization of the solids (X-ray crystallography, thermal properties) will be done in the Chemistry Department, while the testing of the novel material, including performance as bone cement additives, biocompatibility and activity will be done in the Biomaterials Institute (JH).

Based on the biocompatible nature of the alkaline earth metals, and the likelihood of biocompatibility in the resulting materials, we are developing new materials for bone templating and as additives to bone cement. We will make use of the flexibility of the phosphonate ligand (i.e., linker length, nature and rigidity) to introduce biomimetic functionality, and design materials exhibiting differently sized pores, to obtain materials for a range of medical applications. We are especially intrigued by the potential of bioactivity, which enables a strong connection between an implant and bone.



The combination of expertise on the preparation of phosphonates (KR, for an example of a recently prepared compound see above) with that on PMMA based bone cements (JH) will significantly increase the application base of the materials, as the phosphonates may be molded into specific shapes for bone templating applications.

The bioactive materials will be included in two-solution bone cements to enhance the connection between the cement, the bone and implants. This material will also be tested for the treatment of vertebral fractures, or enhanced strength of bone cement for total joint replacement fixation though introduction of the phosphonates. It is expected that incorporation of phosphonates in two-solution bone cements will improve the biocompatibility of the cements.

Questions? Please contact:

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