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## Bone-like nanocomposite of hydroxyapatite and collagen as artificial bone

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Bone is a typical nanocomposite mainly composed of carbonate containing non-stoichiometric hydroxyapatite nanocrystals and type-I collagen molecules. They aligned along each other in the primary structure of bone and realize strong but biologically resorbable nature. Our group hypothesized that artificial bone with similar chemical composition and nanostructure would be excellent materials for bone regeneration as the same as natural bone. Simultaneous titration of  $\text{Ca}(\text{OH})_2$  and collagen- $\text{H}_3\text{PO}_4$  solutions under controlled reaction pH and temperature allows to synthesize bone-like nanostructured hydroxyapatite/collagen nanocomposite (HAp/Col) very easily. The HAp/Col can be formed into dense and porous bodies, membrane and self-setting paste. The HAp/Col is incorporated into bone remodeling paste when it is implanted into bone defect. The porous body of the HAp/Col (HAp/Col sponge) showed sponge-like viscoelasticity in wet condition and fit to any shape of bone defect very easily. The HAp/Col sponge showed higher efficacy for regenerating small to large bone defect in comparison to bioresorbable  $\beta$ -tricalcium phosphate porous body in human clinical trial, by its excellent bioactivity and fitting ability to bone defects. The HAp/Col sponge is already sold in Japan as Refit®. Recently, we found that the HAp/Col coating on Ti metal accelerate by 3 times to form direct bonding between host bone and Ti implant. In addition, paste for minimum invasive surgery as well as 3D printing and gene transfer substrate using the HAp/Col were investigated. Including these, possibility of the HAp/Col nanocomposite will be presented in the symposium.

### Biography

Kikuchi has completed his PhD from Waseda University, Japan and postdoctoral studies from National Institute for Research in Inorganic Materials. He is the leader of Bioceramics group in National Institute for Materials Science as well as Professor of Hokkaido University. He has published more than 100 papers with h-index of 22 and serving as board member of several scientific societies and a convener of ISO / TC150.

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