Division of Biomedical Materials

Department of Inorganic Biomaterials

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Bioceramics for treatment of cancer and bone disease

- 1. Development of ceramic micro/nano-particles for intraarterial therapy for deep-seated cancer
- 2. Formation of antibacterial and bioactive TiO₂ surface layer on titanium by surface chemical treatment
- 3. Elucidation of bone-bonding mechanism of hydroxyapatite -From a view point of protein adsorption-

Negatively charged c-face

- 4. Development of inorganic-organic composites for wound dressing
- 1. Chigama H, Kanetaka H, Furuya M, Yokota K, Kawashita M: Evaluation of apatiteforming ability and antibacterial activity of raw silk fabrics doped with metal ions, Mater. Trans., 60, 808-814, 2019. Kawashita M, Development and evaluation of the properties of functional ceramic
- 2. microspheres for biomedical applications, J. Ceram. Soc. Japan, 126, 1-7, 2018. Kawashita M, Iwabuchi Y, Suzuki K, Furuya M, Yokota K, Kanetaka H: Surface
- 3. Structure and in vitro apatite-forming ability of titanium doped with various metals, Colloids Surf. A, 555, 558-564, 2018.
- Kawashita M, Hasegawa M, Kudo T, Kanetaka H, Miyazaki T, Hashimoto M: Effect of fibronectin adsorption on osteoblastic cellular responses to hydroxyapatite and
- alumina, Mater. Sci. Eng. C, 69, 1268-1272, 2016. Kawashita M, Endo N, Watanabe T, Miyazaki T, Furuya M, Yokota K, Abiko Y, Kanetaka H, Takahashi N: Formation of bioactive N-doped TiO₂ on Ti with visible 5. light-induced antibacterial activity using NaOH, hot water, and subsequent ammonia atmospheric heat treatment, Colloids Surf. B, 145, 285-290, 2016.

We are conducting research on medical materials (especially ceramic materials) that contribute to the treatment of cancer and bone diseases. Specifically, various materials synthesis methods such as sol-gel method are used to synthesize medical therapeutic materials (especially fine particles) and bone filling materials, and to evaluate their chemical, physical and biological properties. We aim to gain knowledge that leads to clinical application.

Development of ceramic micro/nano-particles for Formation of antibacterial and bioactive TiO₂ surface intra-arterial therapy for deep-seated cancer layer on titanium by surface chemical treatment Radioactive or magnetic microspheres are useful for intra-Trace element-doped TiO₂ can show visible-light arterial radiotherapy or hyperthermia of cancer. We try to responsive antibacterial activity as well as bioactivity. We develop radioactive or magnetic micro/nano-particles by try to form antibacterial and bioactive TiO₂ surface layer on titanium by surface chemical treatment. using various synthetic techniques. Alternating current magnetic field (100 kHz, 100–300 Oe) Dental implant Ex vivo (operation room etc.) In vivo 3 Bone Intra-arterial radiotherapy / hyperthermia Bioactivity Surface Artificial joint modification Hepatio Trace el nent race elem artery oped TiO₂ doped TiO₂ Cathe Titanium Titanium adioactive / Magnetic (20-30 µm) Visible-light responsiv 0 antibacterial activity Elucidation of bone-bonding mechanism of hydroxyapatite -From a view point of protein adsorption-Hydroxyapatite (HAp) is widely used as an Hydroxyapatite (HAp) Enhancement of MC3T3-E1 cell artificial bone because it bonds to living bone. Fibronectin (En) nt and spre ıg by a However, the detailed bone-bonding mechanism Proliferation Differentiation Attachment Spreading of HAp has not been clarified yet. We are trying to elucidate the bone-bonding mechanism of HAp from a view point of adsorption of serum proteins such as fibronectin (Fn). Cytoskeleton fibe Integrin α -Alumina (α -Al₂O₃) RGD motif Cell membrane Spreading Proliferation Differentiation Fn So -Electrostatio Electrostatio attractio , repulsion Positivel a-Al₂O₃ charged HAp a(b)-face 9 h ≅7 days ≅ 17 days

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