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## Novel functional materials created by mimicking Fe oxidizing bacterium-involved formation processes of iron oxides complex

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Iron-oxidizing bacteria, the genus *Leptothrix* or *Gallionella* produce extracellular, uniquely-shaped micro sheaths or fibrous bundles mainly composed of Fe oxides [named “Biogenous Iron Oxides (BIOX)”] ubiquitously in hydrosphere where groundwater outwells. These bacteria are often utilized as Fe collectors in water purifying plants. However, tones of BIOX yearly accumulated in the plants have been regarded as natural waste and discarded by landfill. Our microscopic and spectroscopic studies proved that BIOX was an ingenious hybrid of organic/inorganic materials produced through the interaction of bacterial exo-polymers with aqueous-phase inorganics such as Fe, Si, P and often Ca. Intriguingly, BIOX was discovered to have a variety of the industrial functions: lithium-ion battery anode material, catalyst enhancer, plant protectant and porcelain pigment. We have aimed to establish technology to create the novel functional materials for industrial application by mimicking the biogenic processes of BIOX formation. We succeeded to manipulate the texture and chemical components of the sheath-type BIOX by altering components of the culture medium for an isolated strain of *Leptothrix* sp. OUMS1, leading to creation of Si-rich Fe oxides complexes with diverse crystallinity, to create Al-rich BIOX by culturing OUMS1 in media containing varied amounts of Al and to create nano-scaled architectural acidic silica by heating naturally produced BIOX in a hydrogen gas flow followed by HCl treatment to remove Fe particles. These novel materials have great industrial potentials beyond artificially synthesized Fe oxides and naturally produced BIOX. We expect the eco-friendly, nontoxic, low-cost BIOX and related novel materials as fascinating functional materials for the next generation.

### Biography

Hitoshi Kunoh received PhD from Southern Illinois University in 1970 and Dr Agriculture from Kyoto University in 1972. He joined Mie University as Assistant Professor in 1970 and was promoted to Professor in 1988. He has published more than 300 papers concerning plant pathology and microbiology in reputed journals. He served as Dean of Faculty of Bioresources, Mie University and as President and Editor-in-chief of the Japanese Society of Plant Pathology. Since 2009 he has worked as a guest Professor for the government-granted project, “Toward Creating Innovative Applications to Harness the Novel Functions of Nano-scaled Iron Oxides of Microbial Origin”.

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### Notes: