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Unique organic/inorganic hybrid material produced by an aquatic iron-oxidizing bacterium, *Leptothrix* sp.

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A type of aquatic Fe/Mn-oxidizing bacteria, the genus *Leptothrix*, produces uniquely-shaped microsheaths (ca. 1 m in diameter) ubiquitously in natural hydrosphere at ambient temperature. The sheath is characterized by an extracellular, microtubular, Fe- or Mn-encrusted structure. Basic sheath-construction proceeds in two steps under culture conditions: i) Release of fibrillar exopolymers (saccharic and proteinous) from bacterial cells and iinitial assemblage and ii) the chemical interactions between the organic exopolymer fibrils and aqueous-phase inorganic ions. The sheath is characterized by i) being composed of Fe, Si, P [approximate rate (atomic %): Fe:Si:P=75:20:5], and often Ca, ii) having Si and P linked with Fe via O, and Fe existing mainly as iron oxides, and iii) amorphous texture composed of nano-scaled particles (ca 3 nm diameter). It is extremely noteworthy that the sheath material has a superior potential (large capacity etc.) as an anode material of Li-ion battery to that of broadly-used carbon anode. In addition, the sheath material exhibits amazingly wide-ranged functions as i) efficient enhancer of catalyst activity, ii) high affinity to human cells, and iii) bright reddish color for pottery, and iv) plant protection activity against diseases. We place our hopes and expectations on the eco-friendly, nontoxic, low-cost material of bacterial origin as fascinating functional material for the near future.

Biography

Hitoshi Kunoh received PhD from Southern Illinois University in 1970 and Doctorate in 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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