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Research Fields

Aerosol technology, Material engineering,
Analysis of transport phenomena

Key words

Aerosol, Ceramics, nanoparticles, Functional materials, Lithium ion battery, Energy storage and conversion materials

1. Scope of Research

We investigate the preparation of nanoparticles, nanostructured particles or porous thin films via aerosol process, such as spray pyrolysis or electrostatic spray deposition and their application to the electrode materials of lithium ion battery, solid oxide fuel cell or dye-sensitized solar cells.

2. Research Topics

Novel cathode materials of lithium ion battery

<Research subjects>

1. Preparation of nanoparticles or nanostructured particles of lithium manganese spinel by spray pyrolysis and their electrochemical properties
2. Preparation of polyanion based cathode materials of lithium ion battery by spray pyrolysis and their electrochemical performance

Synthesis of functional ceramics powder by using fluidized bed reactor

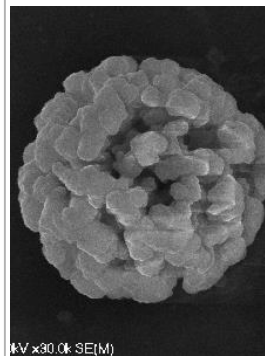
<Research subjects>

1. Preparation of LiMn_2O_4 powders by drip pyrolysis in fluidized bed reactor
2. Preparation of $\text{LiM}_x\text{Mn}_{2-x}\text{O}_4$ (M=Mn, Co, Al and Fe) powders via spray pyrolysis and Fluidized bed hybrid system

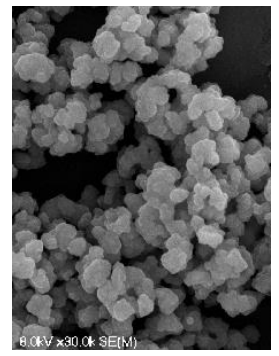
Morphology control of functional ceramics thin films by electrostatic spray deposition

<Research subjects>

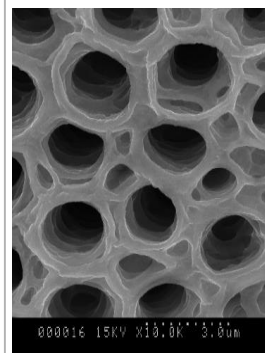
1. Preparation of porous LiCoO_2 thin films by electrostatic spray deposition
2. Preparation of porous TiO_2 thin films by electrostatic spray deposition and their application to dye-sensitized solar cells
3. Preparation of electrode thin films of solid oxide fuel cell by electrostatic spray deposition and their morphology control



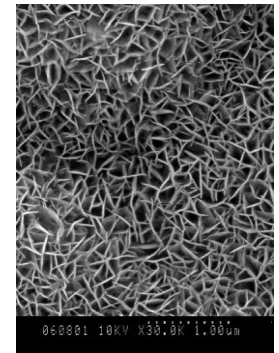
Spherical nanostructured LiMn_2O_4 particle



LiMn_2O_4 nanoparticles



LiCoO_2 porous thin films



3. Publications and Activities

- Papers
1. Taniguchi, et al., "Preparation of LiMn_2O_4 Powders via Spray Pyrolysis and Fluidized Bed Hybrid System", *AIChE J.*, 52, 2413-2421(2006).
 1. Taniguchi & Z. Bakenov, "Spray Pyrolysis Synthesis and Electrochemical Studies of Nanostructured $\text{LiFexMn}_{2-x}\text{O}_4$ Cathode Materials for Large Scale Lithium-ion Batteries," *Powder Technology*, 159,55-62(2005).
 1. Taniguchi & T. Hosokawa, "Deposition of SDC and NiO-SDC thin films and their surface morphology control by electrostatic spray deposition," *J. Alloys and Compounds*, 460, 464-471(2008).