

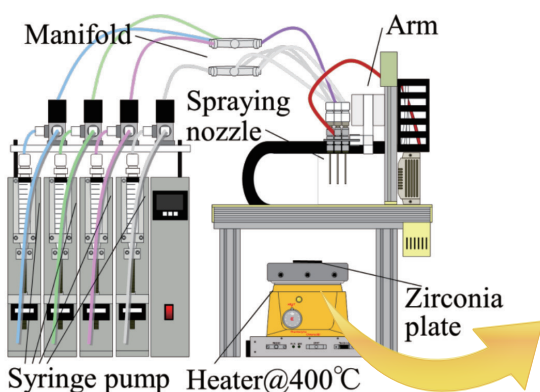
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Purpose of Research

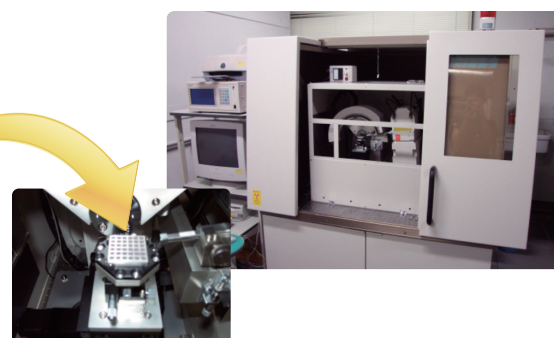
A broad range of multicomponent functional materials are a subject of extensive study and screening. However, as more components are included in a material, the combinations of parameters to be screened (component ratio, temperature, atmosphere, pressure, etc. in the case of composite materials) exponentially increase. In 1960s, peptide synthesis by Dr. Merrifield led to the rise of combinatorial technologies. In the late 1990s, automated synthesizers using multiple inorganic/metal material components were developed, allowing the use of thin films and bulk samples for high-speed material screening. We have developed the electrostatic atomization-type high-speed material screening system “M-ist Combi,” which allows screening of liquid, film, or bulk samples of materials. Using this system, we are investigating novel multicomponent functional materials and obtaining findings that may provide clues for next-generation materials.

Summary of Research

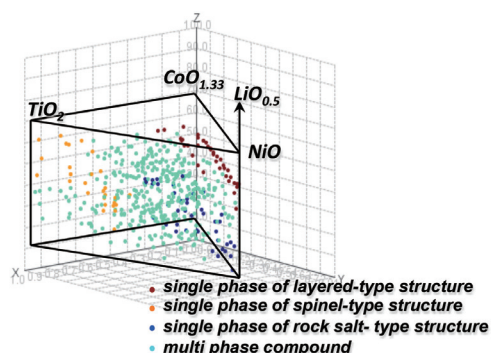
Combinatorial material screening system based on electrostatic atomization: M-ist Combi



Combinatorial high speed X ray powder diffraction



Example: Screening for lithium secondary battery cathode material Reaction of quasi-quaternary Li-Ni-Co-Ti oxide (@ 700°C)



Our system can achieve 100-fold faster material synthesis, 1000-fold lower reagent cost. Because its core technology, electrostatic atomizer, has a simple configuration, post-screening larger scale synthesis of candidate materials is easy

Future Developments

Not only lithium secondary battery cathode materials and oxide thermoelectric materials, but also environmental cleanup materials will be studied. Because our system is compatible with various sample forms (powder, thin film, liquid), screening for optimal paint and building materials (plaster, etc.), plating solutions, conductive paste compositions, and polymers will be possible.

- Awards: Intl. Solid Reactivity Assoc. Best Poster Award, etc., invitation lectures at conferences, companies
- Intellectual Property: Japanese Patent No. 5016960
“Electrostatic atomizer and method of producing samples from main agents”
- Prototype: made
- System demonstration: can be viewed