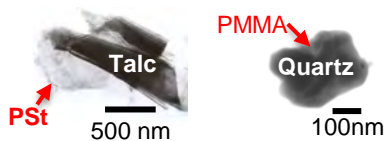


Functional Powders Synthesis by the Mechanochemical Reaction

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Planetary mill (Retsch, PM100) **Dry Bead mill** (Ashizawa, SDA1)



Mechanochemical Polymerization

Monomer add.
(+ Solvent)

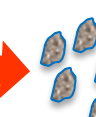
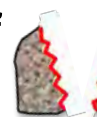
Mechanochemical effect

Heat generation
Increased surface area
Lattice defect
Mechano radical
Mechano ion

Nanoparticle and
Polymer coating

Grinding aid
(Dispersant)

粉碎



Raw
Feed

Compression
Impact
Shear
Friction

Decreased particle surface activity,
Nanoparticle and nanostructured
composit particles

Dry
Milling



Surface activation of the ground powder,
Aggregate formation (The grinding limit)

Content: When mechanical energy is applied to particles through milling operations, not only does size reduction occur, but also some form of chemical change. This phenomenon is termed mechanochemical phenomenon, and chemical reactions utilizing this phenomenon are referred to as mechanochemical reactions. In this study, we conduct the synthesis of functional powders through a one-step milling operation. Generally, the purpose of milling operations is to reduce particle size. As size reduction progresses, the cohesive forces caused at lowering the surface energy of the powder become larger than the milling force, leading to the grinding limit. Nevertheless, by incorporating additives known as dispersants or monomers during comminution, it becomes feasible to control and lower the surface energy, enabling the generation of composite powders with nanostructures and nanoparticles.

Appealing point: Mechanochemical reactions, known for inducing significant chemical changes through a simple mechanical operation like a grinding, have been recognized for a long time. However, our strength lies in the ability to control these reactions.

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