Particle aggregation structure generated during freezing process of colloid and its control

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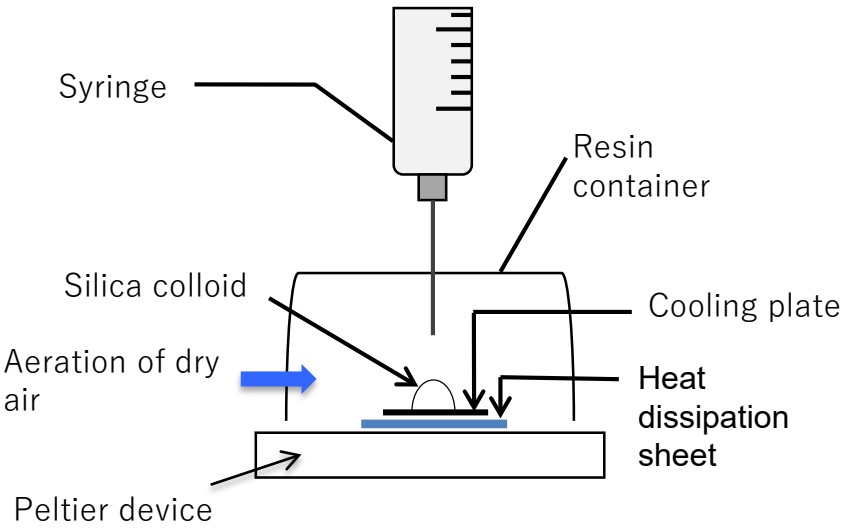
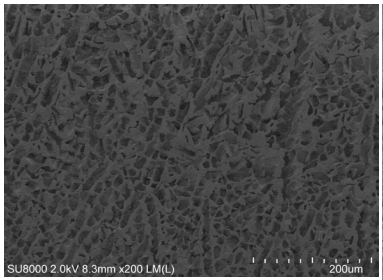
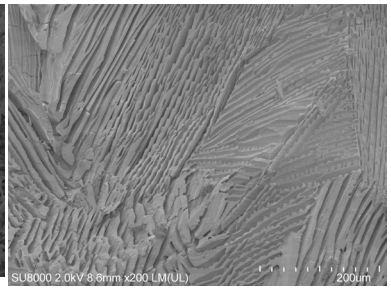




Sponge-like structure



Lamellar structure

Particle dia. : 100 nm,　Particle volume fraction : 20 vol%,
Temp. : −15˚C,　Cooling board : Cu,　Thickness : 0.3 mm

Content :

A dispersion of silica particles (~several hundred nanometers) is frozen on a Peltier device. When freeze-dried after freezing and observing the agglomerate structure of the particles formed during the freezing process, an interesting agglomerate structure is observed depending on the ice growth process.　It seems that the final particle aggregation structure is determined by several factors of cooling speed, particle layer compression due to ice growth, water permeability in the particle layer.　Furthermore, by creating a supercooled state, it is possible to trap ice inside the agglomerates of particles and leave them as voids to create sponge-like agglomerates of particles.

We are not actively considering applications, but in the ordinary cases, preparation of catalyst carriers, drugs with sustained release, etc. can be considered.

Appealing point :

I'm thinking of applying it to industry, but I'm rather trying to go into the fundamentals of phenomena. Doing so may sprout from unexpected places.

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