Promoting nucleation by microwave irradiation, ultrasound and anti-solvent addition

～In-situ nano-size measurement during microwave treatment～

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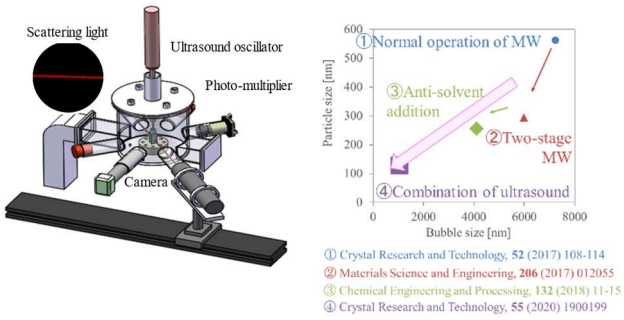
Abstract

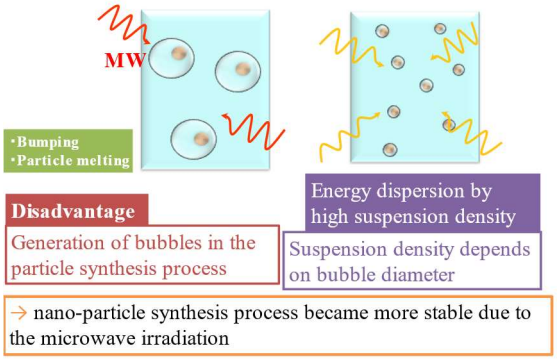
Particle number density produced during microwave irradiation is an important parameter. Superheating behavior, which causes larger bubble size and disordered temperature distribution, is inevitable at higher power. To prevent the superheating behavior and to promote the particle nucleation, a combination of microwave and ultrasound/anti-solvent addition was proposed. In this study, colloidal particle of ferric hydroxide was produced by heating of ferric chloride solution under the irradiation. Results from this study will be useful to achieve optimal operation of ultrasound by observing the bubble profiles under microwave.

Nano-particle synthesis process by microwave



① Crystal Research and Technology, **52** (2017) 108-114
② Materials Science and Engineering, **206** (2017) 012055
③ Chemical Engineering and Processing, **132** (2018) 11-15
④ Crystal Research and Technology, **55** (2020) 1900199

Mechanism of nano-particle synthesis process



Appealing point

The characteristics of microwave irradiation are 'rapid heating' and 'uniform heating'. This heating method is particularly advantageous for nucleation promotion and higher suspension density in nano-particle synthesis processes. Data obtained from this device showed that the bubble size during irradiation strongly depends on the suspension density of the particles. As a result, this technique can be used to measure suspension density and prediction of aggregate shape in the suspension.