# Preparation of Nano-sized Particles by Using a Centrifugal Force Field in Rotating Porous Media



# 2003 Fiscal Year Final Research Report Summary

## Preparation of Nano-sized Particles by Using a Centrifugal Force Field in Rotating Porous Media

Research Project

### Project/Area Number

14350407

### Research Category

Grant-in-Aid for Scientific Research (B)

### Allocation Type

Single-year Grants

### Section

一般

### Research Field

化学工学一般

### Research Institution

Kanazawa University

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### Project Period (FY)

**2002 – 2003**

### Keywords

Centrifugal Force Field / Porous Media / Nano-sized Particle / Mist / Dispersio / Micro-emulsion

### Research Abstract

The present work is aimed at preparing monodisperse nano-sized articles at a high production rate by mixing droplets containing reactants rapidly in rotating porous materials. In the first year, we characterized the dispersion of mists(size distribution, charge one, etc.) formed from test liquid of NaCl-aq. or PAO(poly alpha-olefin). In the last year, the rotating shaft of multiphase contactor was improved to operate the contactor stably at a high rotating speed for a long time. This renewed contactor was applied to the micro-dispersion of MMA(methyl methacrylate) emulsion, followed by the synthesis of PMMA particles by suspension polymerization with inorganic stabilizer. After 300 mL of the pre-stirred O/W suspension of MMA was fed into the eye space of rotating porous cylinder, the entrained mists containing dispersed micro-emulsion

were eventually collected at the outlet of contactor. After a serious of operation was repeated several times, the polymerization of MMA emulsion was initiated at 60℃ to obtain PMMA particles. Then, the PMMA particle size distribution, corresponding to that of the final emulsion was measured with a laser diffraction particle sizer. As a result, it was confirmed that the conditions of continuous phase in the conventional method(C_<surfactant>=0.02wt%, C_<stabilizer>=21.5wt%) were applicable to the experiments with this contactor. The average size of micro-emulsion decreased from 100μm of that of initial fed emulsion eventually to micrometer order with the increase in rotating speed of the porous cylinder. Further, the average emulsion size was successfully lowered up to 2μm by diluting the raw suspension at O/W ratio of 1/2 to 1/10. From these findings, we concluded that this contactor with a rotating porous cylinder owns a potential to prepare micrometer-sized emulsion at a higher production rate than the conventional method, by continuously feeding the raw suspension that has an optimum compositions for the dispersion.

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