

Synthesis of SiO₂ for Creating the Super-Hydrophobic Surface

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1. INTRODUCTION

Recently, polymer nanocomposites have received great interest due to their superior properties when compared with conventional composite materials. Improvements in mechanical properties, such as stiffness and toughness, dimensional and thermal properties could be achieved with nanofillers. The dispersion degree of the filler greatly influences the enhancement efficiency. Therefore, in order to meet those excellent properties, it is very important that the average size of fillers must be present in the nanometer-sized ranges with fine particle distribution in the polymer matrix. One interesting choice is nano-sized silica which has been explored as the filler for polymeric materials and held a great potential for developing high performance polymer [1,2].

2. EXPERIMENTAL

Monodisperse SiO₂ nanoparticles (100.2 nm, 313.7 nm, 558.2 nm, 628.5 nm, 965.4 nm) were prepared from Tetraethyl orthosilicate Ammonia (NH₄OH, Junsei, 28%), Methanol (TEOS, Si(OC₂H₅)₄, 95%, Wako), CH₃OH, 99.9%, Carlo erba). The SiO₂ particle size was measured with particle size analyzer (ELS8000 OTSUKA). The water contact angle was examined by contact angle meter (DSA100, Kruss, Germany). To analyze their morphology, the particles were examined by FE-SEM (JSM7500A, JEOL).

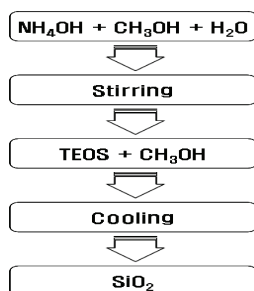


Fig. 1. Preparation scheme for SiO₂ nano sol by TEOS.

3. RESULTS AND DISCUSSION

The contact angle of water was about 134.0°, 137.0°, 143.0°, 139.5° and 139.0° for mixture fabric coated with 100.2 nm, 313.7 nm, 558.2 nm, 628.5 nm and 965.4 nm silica nano-sol, compared with about 120.0° for mixture fabric coated with fluoric polymer. When we mixed particle sizes of 100.2 nm and 558.2 nm by 7:3 volume ratio, the contact angle of water was about 146.2°. And we mixed particle sizes of 313.7 nm and 558.2 nm by 7:3 volume ratio, the contact angle of water was about 141.8°. Also we mixed particle sizes of 558.2 nm and 965.4 nm by 7:3 volume ratio, the best super-hydrophobicity was obtained.

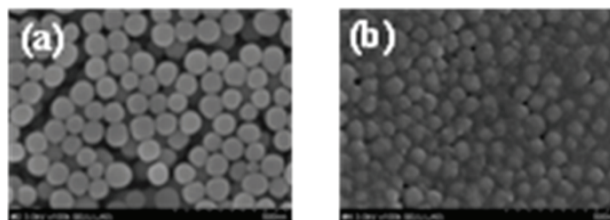


Fig. 2. FE-SEM images of SiO₂ particles. (a) single-size SiO₂ and (b) dual-size structure SiO₂.

4. ACKNOWLEDGEMENT

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5. REFERENCES

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