P-200

Mild 한 조건에서 알콕시실란을 이용한 수용성 활성물질의 실리카캡슐화

Silica Microencapsulation for Hydrophilic Active Materials Using Alkoxisilanes in Mild Conditions

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In this paper, we report the novel approach for the silica microcapsules containing hydrophilic active materials by a W/O (water in oil) microemulsion sol-gel route Our general method provides a direct route to control the microcapsules with spherical morphology and size distributions in the ranges from 1 um to 100 um The use of microcapsules offers greater convenience, improved physicochemical stability, and controlled release of the encapsulated active materials. Applications of micro- or nanocapsules containing active materials have become of increasing importance in the pharmaceutical, medical, foods, cosmetics, and agricultural industries By now, numerous studies have been reported on the encapsulation process for hydrophilic active compounds into silica medium by W/O microemulsion process using sodium silicate or alkoxysilanes as shell materials For the typical W/O systems using alkoxisilanes as shell materials, the mixtures of hydrophilic active compounds and aqueous acids or base catalysts are emulsified in continuous O (oil) phase, and then alkoxisilanes as shell materials are introduced into the continuous phase However, the conventional systems use harsh condition of acid or base catalysts for microencapsulation reactions to control spherical morphology, which badly restricts the kinds of possible active materials because of their denaturation phenomena In this study, we employed the modified alkoxisilanes precursor for shell materials, and introduced the mixture of hydrophilic active materials and the precursors as W (water) emulsion phase into continuous oil phase In this system, the microencapsulation process was possible in mild catalytic conditions The mild conditions offer some advantages not only for environmentally friendly process but also for wide choices over active materials The characteristics of the microcapsules focused on morphology and size distributions are studied by Optical micrograph, SEM, DLS, ^{29}Si-NMR