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Synthesis of slow release urea fertilizer through recrystallization of urea incorporating mesostructured cellular foam (MCF) silica and its release behaviour

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Abstract. In the present study, various slow release urea fertilizers (SRUFs) were prepared through recrystallization of urea incorporating mesostructured cellular foam (MCF) silica with various compositions. In the preparation, corn starch (0.2-0.8 g) as a binder was added to a mixture of mesostructured cellular foam (MCF) silica (9.2-9.8 g) and melted urea (90 g). Then, the admixture was put in to a mould and extruded to obtain MCF/SRUF in a pellet form. After that, the MCF/SRUF was dried at 50 °C for 8h. The MCF/SRUF was examined in terms of urea desorption mechanism through static release experiments. Characterization of MCF/SRUF was observed through scanning electron microscopy with energy dispersive x-ray (SEM-EDX) analysis and Fourier-transform infrared spectroscopy. All of MCF/SRUFs more slowly released urea in water than conventional urea fertilizer. Release mechanism the MCF/SRUF was Fickian diffusion with urea release kinetic model of $Y= 0.015107t^{0.44371}$