
Composition Design for New Generation Controlled Release Glass Fertilizer

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Abstract

The rapid growth of the global population is leading to a decreasing amount of arable land per person. Consequently, to meet the escalating food demands of this expanding population, the use of fertilizers in agriculture has become unavoidable. Even though the chemical fertilizers are widely employed in order to increase the agricultural yield, they pose harmful effects on the environment and living organisms in addition to their high solubility in water results in a significant portion of nutrients being washed away from the soil before the plant uptake. Commercially available Controlled Release Fertilizers (CRFs) emerge as eco-friendly alternatives but face challenges in competing with chemical fertilizers. In the scope of ongoing research for novel CRF technologies, glass fertilizers have gained attention due to their rich nutrient contents, eco-friendly behavior and the controllable dissolution rates through compositional changes. In this study; various phosphate based glasses have been synthesized and investigated in terms of their physical, thermal and structural properties along with their chemical durability in different mediums. Compositional dependence on chemical durability of phosphate glasses and their potential to be used as agricultural fertilizers has been evaluated.

Keywords: Glass fertilizers, phosphate glasses, dissolution behavior, controlled release fertilizers

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