Magnetic fields-assisted movement of iron oxide-nanoparticles-incorporated large scale alginate capsules

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Abstract

Biocompatible capsules have recently been highlighted as novel delivery platforms of any “materials” (e.g., drug, food, agriculture pesticide) to address current problems of living systems such as humans, animals, and plants in academia and industry for agriculture, biological, biomedical, environmental, food applications. For example, biocompatible alginate capsules were proposed as a delivery platform of biocontrol agents (e.g., bacterial antagonists) for an alternative to antibiotics, which will be a potential strategy in future agriculture. Here, we proposed a new platform based on biocompatible alginate capsules that can control the movements as an active target delivery strategy for various applications including agriculture and biological engineering. We designed and fabricated large scale biocompatible capsules using alginates and custom-made nozzles as well as gelling solutions. To develop the active target delivery platforms, we incorporated the iron oxide nanoparticles in the large scale alginate capsules. It was found that the sizes of large scale alginate capsules could be controlled via various working conditions such as concentrations of alginate solutions and iron oxide nanoparticles. As a proof of concept work, we showed that the iron oxide particles-incorporated large scale alginate capsules could be moved actively by the magnetic fields, which would be a strategy as active target delivery platforms for agriculture and biological engineering (e.g., controlled delivery of agriculture pesticides and biocontrol agents).

Keywords
target delivery system, biocompatible capsule alginate, iron oxide, magnetic field

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