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Porous zeolite y-alginate hydrogel composites for electrically controlled transdermal drug delivery

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The electrical current is used to enhance drug permeation in transdermal drug delivery (TDD) via iontophoresis. However, the effective transport of the drug ions is decreased via the ion transport competition between buffer ions and drug ions. This limitation is eliminated by encapsulating the drug ions in the porous zeolite. In this work, folic acid (FA) as the cationic model drug was loaded into the zeolite Y by an ion-exchange process before embedding in a Ca-alginate matrix in order to study the release mechanism under applied electrical potential. The FA was released from the zeolite/Ca-alginate composite hydrogel through the diffusion controlled mechanism (Fickian diffusion) in two steps: i) the FA release from the zeolite via the ion-exchange process; and ii) the enhanced diffusion transport through hydrogel. The amount of FA release depended on the electrical potential and Si/Al ratio of zeolite. The higher Si/Al ratio (lower aluminum content) provided the higher amount of FA release due to a lower hydrogen bonding interaction from aluminum. Moreover, the electrical potential applied with the anode on the matrix effectively increased the diffusion of drug resulting from the electro-repulsive force between the positively charged FA and the charged electrode. Therefore, the fabricated zeolite/hydrogel is of a potential material to be used in electrically controlled TDD.

Biography

Nophawan Paradee completed her B.Sc. with a first class honour in Industrial Chemistry from King Mongkut's University of Technology North Bangkok, Thailand in 2008, and a PhD in Polymer Science from the Petroleum and Petrochemical College, Chulalongkorn University, Thailand in 2016. She has published 15 papers in reputed journals.

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