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Temperature Controlled Loading and Release of Curcumin in Polyelectrolyte Multilayers Thin Films

Rateeya Saikaew^{1,2}, Philippe Marsal³, Benjamin Grenier³, Stephan Thierry Dubas^{*1,2}

1 The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok 10330, Thailand

2 Center of Excellence on Petrochemical and Materials Technology, Bangkok 10330, Thailand

3 CINaM, UMR 7325 CNRS, Aix-Marseille Université Campus de Luminy, case 913, 13288 Marseille Cedex 09, France,

Abstract

The temperature triggered loading and release of hydrophobic model drug (1,7-bis[4-hydroxy-3-methoxyphenyl]-1,6-heptadiene-3,5-dione) (curcumin) from polyelectrolyte multilayer (PEM) thin films was demonstrated. Thin films built from the layer-by-layer (LbL) deposition of poly(diallyldimethylammonium chloride) (PDADMAC) and poly(4-styrene sulfonate) (PSS) were dipped in curcumin and studied as patches that could be used in temperature controlled drug delivery applications. Three different solvents (methanol, ethanol and isopropanol) were mixed with different fractions of water (from 60:40% to 95:5% aqueous:organic solvent) and fixed amount of curcumin (100 ppm). The loading of curcumin in the PEM increased when the polarity of the solvent mixture was increased or when the temperature was decreased. Interestingly, curcumin could spontaneously be released in warm water and as an example, curcumin was loaded PEM film at 5°C and release at 37°C thus demonstrating the body temperature triggered release of a hydrophobic model drug. Using this method a new type of transdermal patch for the release of hydrophobic drugs from PEM membrane would be possible.

Keywords : Polyelectrolytes, layer-by-layers, curcumin, thermo-responsive, drug delivery.

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