Design of CO_2-resposive nanomaterials with potential for triggered drug delivery

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The ability of amphiphilic molecules to form self-assembled structures makes them relevant (are of interest) in many domains. For instance, their nanostructured lipid-water domains can be used as a matrix for drug molecules. A controlled and targeted release from these nanocarriers can be achieved by making these nanostructures respond to external stimuli such as light, pH, redox reagent, temperature and CO_2. Here, the design of CO_2 responsive nanostructures in excess of water formed by: glyceryl monooleate (GMO) in association with (Z)-N,N-dimethyl-N-((Z)-octadec-9-en-1-yl)acetimidamide (OAm) is presented. The type of structures formed by different GMO:OAm mixture as well as phase transitions upon addition of CO_2 were investigated using small angle X-ray scattering (SAXS) and dynamic light scattering (DLS). The sponge phase (L_3) and inverse hexagonal (H_2) were identified at 1:1 GMO:OAm composition, respectively with and without the addition of CO_2. The release profile form these mesophases were established with the use of Rhodamine B as a model hydrophilic drug. The release rate of the dye depended on the type of liquid crystalline structure, the sponge phases formed upon addition of CO_2 presented a slower release rate. The results from this thesis provide a fundamental understanding of CO_2 triggered functional nanomaterials, and may guide the future design of drug delivery.

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