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Lipophilic molecular rotor to assess the viscosity of oil core in Nano-Emulsion droplets

Abstract:

Characterization of nanoscale formulations is a continuous challenge. Size, morphology and surface properties are the most common characterizations. However, physicochemical properties inside the nanoparticles, like viscosity, cannot be directly measured. Herein, we propose an original approach to measuring dynamic viscosity using a lipidic molecular rotor solubilized in the core of nano-emulsions. These molecules undergo conformational changes in response to viscosity variations, leading to observable changes in fluorescence intensity and lifetime, allowing them to sense the volume properties of nanoscale formulations. The lipophilic molecular rotor (BOPIDY derivatives) was specifically synthesized and characterized as oil viscosity sensing in large volumes. A second part of the study compares these results with rBDP-Toco in nano-emulsions. The objective is to evaluate the impact of the formulation, droplet size and composition on the viscosity of the droplet's core. The lipophilic rotor showed a universal behavior, whatever the oil composition, giving a master curve. Applied to nano-formulations, it discloses the viscosity in the nano-emulsion droplets, enabling the detection of slight variations between reference oil samples and the nano-formulated ones. This new tool opens the way to the fine characterization of complex colloids and multidomain nano and microsystems, potentially applying hybrid materials and biomaterials.

Biography

Mohamed Elhassan completed his master's degree from the University of Gezira, Faculty of Pharmacy, Sudan. He is currently a lecturer in the Department of Pharmaceutical Technology at the Faculty of Pharmacy, University of Gezira, Sudan. Mohamed is now pursuing his PhD at INSERM, UMR 1260, Regenerative Nanomedicine (RNM), Université de Strasbourg, France.