Sujet d'Alternance Recherche 1A - 2021/22

Titre :	**Synthesis of polyurea microcapsules by a hybrid method of microfluidic emulsification and interfacial polymerization**
Laboratoire : Nom : Coordonnées :	**M2P2 UMR7340** **Centrale Marseille Plot 6** **38 rue Joliot-Curie 13451 Marseille**
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Descriptif du projet :	**Microcapsule is a small (1 to 1000 µm) sphere-like object, consisting of a liquid or solid core with a uniform shell (e.g., polyurea). Polyurea microcapsules gain more and more attention because of their large potentiality in domains such as cosmetics and energy storage. Their production begins by dissolving isocyanates in relevant solvents such as esters. In the next, this oil phase is emulsified by an aqueous phase to form an O/W emulsion. Then, amines are added into this emulsion, which triggers a polycondensation between these two reactants at the interface.** **Generally, this reaction can happen at room temperature when using a high reactive amine. However, high reactive amines are commonly volatile and toxic. In this case, some ammonium salts can be good alternatives which are not toxic but less reactive. For such ammonium salts, a moderate temperature (60-80 °C) is necessary to accelerate the reaction rate. Our previous study shows that a sudden change in temperature (heating) results in the demulsification of a stable emulsion that is formed at room temperature.** **To achieve a continuous production of microcapsules with calibrated sizes, microfluidics that can ensure a generation of monodispersed droplets inside microchip and then a formation of polyurea shells inside collection tube, is taken in this project. Hence, another difficulty here is the instable droplets (hydrophobic) within the collection tube (PDMS) because of incorrect wetting conditions between these two parts.** **One of the objectives for this project is to explore the stability of an ester-in-water emulsion at high temperature, where the change in volume and in interfacial tension due to a heat transfer may be the possible reasons for demulsification. Another objective is to verify the wetting conditions of ester/isocyanate droplets on a surface made of PDMS with different surfactants. Above all, an exhaustive bibliography study to answer above questions is needed.** **If you are interested in this project, please feel free to contact us.**