

Poly(urea – formaldehyde) microcapsules for self-lubricating applications

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Moving parts of all mechanical systems need to be lubricated for the efficient operation of the system. The effectiveness and stability of lubrication are crucial for improving reliability and lifetime of manufactured products, also reducing wastes of natural resources and energy. Introducing microcapsules containing lubricant into the surface of moving parts, significantly improves anti-friction properties and wear resistance. When the surface is subjected to friction, the microcapsules are ruptured and the encapsulated lubricants are released onto the surface, forming a boundary lubrication film that significantly reduces the friction coefficient and wear rate. The aim of the current work is to produce poly(urea-formaldehyde) microcapsules with an encapsulated lubricating oil to be used in metal coating produced *via* thermal spraying.

Poly(urea-formaldehyde) microcapsules preparation was carried out by one stage *in situ* polymerization in an oil-water emulsion. The encapsulation process took place in a closed reaction vessel under mechanical agitation based on the work of Tzavidi et al. (Journal of Applied Polymer Science, 2020). The capsules were collected as free-flowing white powder after vacuum filtration, washing with hexane and drying at room temperature for 24 h. Spherical microcapsules were obtained with a size ranging from 57 to 88 μm , high encapsulation efficiency (up to 79 %) and increased thermal stability ($T_{d5\%} > 210\text{ }^{\circ}\text{C}$).

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