From spirulina to nanoinnovation, fluorescent phycobilins to make nano-catalysts.

Abstract

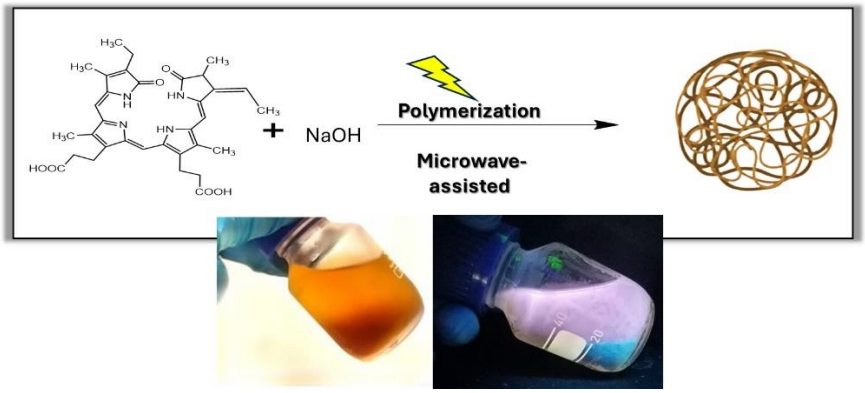

Figure 1 schematics synthesis of nano polymers phycobilins-based

Spirulina algae is a superfood rich in protein, antioxidants, and lipids, with 2.5% of these being unsaturated fats [1–3]. Notably, it contains a high concentration of phycobiliproteins, which are watersoluble protein pigments with significant antioxidant properties [4]. These pigments derive their distinctive color from chromophore groups called phycobilins, composed of an open chain of four pyrrole rings [5]. These chromophores are directly attached to the protein via a thiol bond, which can be broken with alcohol [6, 7]. This molecule has considerable application potential; one of its key properties is

its ability to emit light when irradiated with visible wavelengths, making it valuable in the pharmaceutical industry as a fluorescent protein binder [8]. Additionally, it serves as an excellent precursor for synthesizing porphyrins, used in both pharmaceuticals and electrocatalysis. Based on this information, we aimed to explore methods for efficiently extracting these proteins from spirulina, purifying them to obtain a pure fluorescent starting compound [9]. Using microwaves, this precursor enabled the production of porphyrin metal-free nano-polymer that retain fluorescent properties. These materials have various applications, and the subsequent addition of metal ligands makes them promising candidates for electro- and photocatalysis.

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