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Synthesis of Rose Bengal-based polymer colloids by RAFT PISA for photosensitized singlet oxygen production

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Harvesting visible light to implement low energy processes fulfills some principles of green chemistry. Photosensitized singlet oxygen production involving light, oxygen from air and catalytic amount of photosensitizer is particularly attractive for instance for producing fine chemical intermediates of interest, for air/water photo-decontamination, or for photodynamic inactivation of bacteria¹. Immobilizing photosensitizers on solid substrates improves their handling, recyclability and photostability. Submicronic polymer colloids are versatile substrates of interest for photosensitized singlet oxygen production. We previously showed the interest of polymerization in aqueous dispersed media polymerization as eco-friendly process to design submicronic photoactive polymer particles anchoring Rose Bengal (RB) as photosensitizer, either microgels² by miniemulsion polymerization or film forming core-shell latexes³ by emulsion polymerization-induced self-assembly (PISA). In order to achieve a sustainable efficient photochemical process, the present work aims to design photoactive submicronic polymer colloids directly in ethanol to meet the challenge of continuous flow photo-oxidation of bio-based molecule in ethanol while paving the way for organic photocatalyst recycling. This study focuses on the synthesis of 3 series of photosensitizer-based core-shell latex particles synthesized by RAFT dispersion PISA in ethanol. Through the determination of the average quantum yield of singlet oxygen production (ϕ_{Δ}), we proved the efficient production of singlet oxygen at the particle/alcohol interface under visible light irradiation. The present study proposes to investigate whether some structural parameters might affect ϕ_{Δ} , such as the chemical structure of the outer stabilizing block, the degree of polymerization of the inner solvophobic block tuning the colloidal size or the RB loading. The efficiency of these RB-based latexes in the continuous flow photo-oxidation of a bio-based molecule, investigated by LGC (INPT Toulouse, France) partner will be briefly introduced. We will also introduce the photo-induced bactericidal properties (collaboration group P. Fernandez, Ulster University, Belfast, UK) of the polymer films prepared by casting the RB-grafted block copolymer waterborne latexes.³

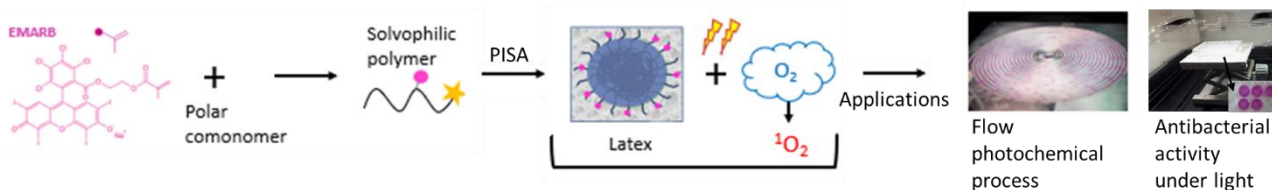


Figure 1: General scheme of synthesis of photosensitizer-based polymer colloids and applications

Références :

- [1] M. Magaraggia, F. Faccenda, A. Gandolfi, G. Jori, JEM, 8, 923-31, **2006**
- [2] L. Petrizza, M. Le Behec, E. Decompte, Hind El Hadri, S. Lacombe, M. Save. Polym. Chem., 10, 3170, **2019**
- [3] C. Boussiron, M. Le Behec, J. Sabalot, S. Lacombe, M. Save, Polym. Chem., 12, 134, **2021**