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DESIGN AND POTENTIAL COSMETIC APPLICATIONS OF MULTI-RESPONSIVE MICROGELS AND SELF-ASSEMBLED MICROGEL FILMS

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In recent years, among the broad research field in materials science, microgel particles have received considerable attention as controlled delivery systems. Microgel particles are environmentally responsive particles with incomparable chemical and physical versatility. These stem from the unique combination of their simple synthesis, large surface area, variation of their volume in response to different stimuli, and their ability to contain different types of small molecules and even macromolecules due to their porous structure. These properties make them an outstanding potential choice to be used as effective smart delivery systems. Although the design of microgels will be dependent on the requirements established by the specificity of the application, current developments tend to prepare multi-responsive microgels that respond simultaneously to a combination of several stimuli in order to obtain more effective delivery systems. In this sense, thermo- and pH-sensitive microgels have received significant attention as smart delivery systems. Concerning delivery applications, the design of innovative delivery systems is resulting in the new product development in cosmetic. The key parameter for achieving the most effective cosmetic and personal care products is the controlled release of active cosmetic molecules to the target site of action on/in the skin. Therefore, the design of the sophisticated and effective targeted delivery systems is considered to be the panacea of modern cosmetic. Herein, the potential application of different multi-responsive oligo (ethylene glycol)-based microgels as smart delivery systems of different cosmetic active molecules (hydrophobic, hydrophilic and macromolecules) has been studied. In addition, those microgels have been taken to the next level producing multi-responsive self-assembled microgel films from a fast bottom-up approach. The results obtained indicate that multi-responsive oligo (ethylene glycol)-based microgels and films are new potential vehicles to design sophisticated and controllable cosmetic active delivery systems.

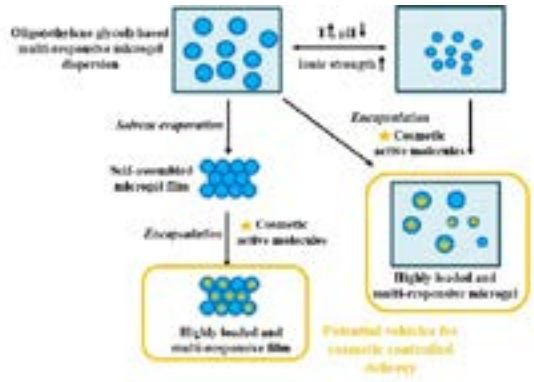

Figure 1: Scheme of cosmetic active molecules encapsulation process into multi-responsive microgel and films.

Recent Publications

1. Aguirre G, Ramos J and Forcada J (2016) Advanced design of T and pH dual-responsive PDEAEMA-PVCL core-shell nanogels for siRNA delivery. Journal of Polymer Science Part A: Polymer Chemistry 54:3203-3217.
2. Aguirre G, Villar-Alvarez E, Gonzalez A, Ramos J, Taboada P and Forcada J (2016) Biocompatible stimuli-responsive nanogels for controlled antitumor drug delivery. Journal of Polymer Science Part A: Polymer Chemistry 54:1694-1705.
3. Pikabea A, Aguirre G, Miranda J I, Ramos J and Forcada J (2015) Understanding on nanogels swelling behavior through a deep insight into their morphology. Journal of Polymer Science Part A: Polymer Chemistry 53:2017-2025.
4. Aguirre G, Ramos J, Heuts J P A and Forcada J (2014)

Biocompatible and thermos-responsive nanocapsule systhesis through vesicle templating. Polymer Chemistry 5:4569-4579.

5. **Aguirre G, Ramos J and Forcada J (2013) Synthesis of new enzymatically degradable nanogels. Soft Matter 9:261-270.**

Biography

Garbine Aguirre has received her BSc in Chemistry from the University of the Basque Country (UPV/EHU) in 2009. She remained at UPV/EHU and undertook her PhD under the supervision of Dr. Jose Ramos and Prof. Jacqueline Forcada, obtaining her Doctorate in 2015 with special mention as International Doctor. During the PhD, she has spent four months in the group of Prof. J.P.A. Heuts, at Eindhoven University of Technology. Her thesis concerned the synthesis and characterization of new stimuli-sensitive biocompatible and biodegradable nanogels that could be potentially useful as nanocarriers in controlled drug/gene delivery. Then, in 2016, she held a Postdoctoral Researcher position at EPCP group, IPREM, Université de Pau & Pays Adour (UPPA) in collaboration with LVMH Parfums Christian Dior to work with Prof. Laurent Billon. Her research focuses on the synthesis, characterization, and biotechnological and cosmetic applications of biocompatible and/or biodegradable stimuli-responsive microgels.

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