

5th International Conference on

Physical and Theoretical Chemistry

October 11- 13, 2018 | Edinburgh, Scotland

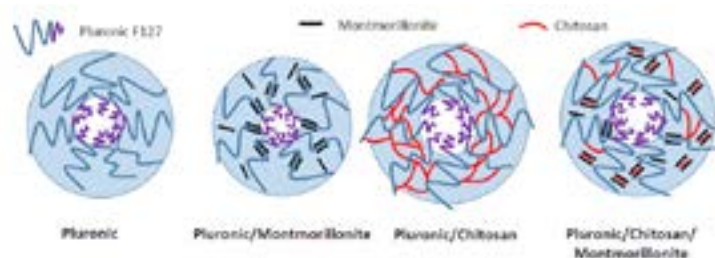
Dynamical and structural characterization of thermally responsive pluronic-based nano-delivery systems

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Statement of the Problem: The combination of pluronic and nanoparticles is currently receiving considerable interest in biomedical applications. In this context, investigating and understanding the structural and dynamical properties of pluronic-based systems is crucial to optimize the formulation of high performance multifunctional structures. So far, the effects of polysaccharides and of clays singularly added on a pluronic water dispersion were investigated. The combined addition of chitosan and montmorillonite opens the possibility to join the properties of the single constituents to formulate bio-based temperature-sensitive vehicles.

Methodology & Theoretical Orientation: Chitosan, montmorillonite and chitosan-montmorillonite nanocomposites were added on a concentrated pluronic F127 aqueous solution. The pluronic-based systems were investigated by differential scanning calorimetry (DSC), X-ray diffraction (XRD), rheology, Fourier transform infrared attenuated total reflection spectroscopy (FTIR-ATR) and dynamic light scattering (DLS). The gelation and micellization behaviors of pluronic were compared to those of the pluronic-based composites and analyzed in terms of the different elasticity of the investigated samples. FTIR-ATR spectroscopy was applied to analyze different vibrational modes in order to evidence differences in the conformational arrangements of the micelles. Finally, by DLS the dynamics of the pluronic-based/water systems was analyzed and depending upon solution temperature the observed decays were attributed to differently sized diffusive entities.

Conclusion & Significance: The experimental findings give strong evidence for the coexistence of complex states of aggregation allowing us to get a better insight into the architecture of the investigated systems.



Recent Publications:

1. Trong L C P, Djaburov M and Ponton A (2008) Mechanisms of micellization and rheology of PEO-PPO-PEO triblock copolymers with various architectures. *Journal of Colloid and Interface Science*. 328(2):278-287.
2. Muzzarelli R A A and Muzzarelli C (2005) Chitosan chemistry: relevance to the biomedical sciences. *Adv. Polym. Sci.* 186:151-209.
3. Lin H R, Li Y S and Lin Y J (2016) Novel microencapsulated Pluronic–chitosan nanomicelles for lung delivery. *Colloid. Polym. Sci.* 294(7):1209-1216.
4. Zhang W et al. (2010) Synthesis and characterization of thermally responsive Pluronic F127-chitosan nanocapsules for controlled release and intracellular delivery of small molecules. *ACS Nano*. 4(11):6747-6759.
5. Giannakas A et al. (2014) Preparation, characterization, mechanical and barrier properties investigation of chitosan–clay nanocomposites. *Carbohydr. Polym.* 108:103-111.

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Biography

Caterina Branca is currently an Associate Professor of Physics at the University of Messina (Italy). She completed diploma of scientific maturity at the liceo scientifico "archimede", messina, Italy in 1989 and degree in physics at the physics department of the university of messina, Italy in 1996. She was awarded PhD in physics from University of Messina in the year 2000. Her research activity concerns essentially with the study of the structural and dynamical properties of soft condensed matter, such as disaccharide aqueous solutions, polymeric systems, gels, glasses, etc. For such kind of studies a wide class of techniques has been employed such as light (Raman) and neutron scattering (QENS, INS, SANS), photon correlation spectroscopy, Fourier Transform Infrared Spectroscopy, etc. Currently, the research activity concerns with the synthesis and characterization of "smart" polymeric hydrogels and block copolymer micelles as novel carrier systems in the field of drug targeting. She is the author of about 90 articles published in international peer-reviewed journals in addition to numerous conference proceedings.

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