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#P001 - PROTEIN AGGREGATES FOR WATER PURIFICATION

Sara Anselmo - Università degli Studi di Palermo

Other Authors: Salvatore Cataldo, Maurizio Leone, Alberto Pettignano, Anna Sommerer and Valeria Vetri

Water pollution is the contamination of water bodies including lakes, rivers, oceans and it is a leading global risk factor for illness and death for people, plants and living organisms. A principal source of water pollution is industry, from which increasing amounts of toxic pollutants are released including heavy metals such as cobalt, lead and copper. Today various technologies for purifying contaminated water can be applied, a lot of them being typically expensive, ion specific and characterised by low efficiency. For these reason, the search of new biocompatible materials with increased capabilities is strongly needed.

Protein aggregates have already revealed their potential as environmentally friendly, biocompatible, flexible materials for different application ranging from scaffold for tissue engineering to drug delivery.

In peculiar conditions, proteins may destabilise their structure and undergo different association processes leading to amyloid like aggregates. These highly ordered structures stabilised by H-bonds include fibrils, spherulites and particulates. By suitably varying solution conditions it is possible to tune aggregate size and morphologies as well as their physicochemical (hydrophobicity, hydrophilicity, swelling/deswelling properties) and mechanical properties. Amyloid fibrils have already revealed their potential for applications in water purification as fundamental components of carbon based filter membranes used for separating water from heavy metals. Here we present an experimental study where particulates are tested as new tuneable biomaterials for metal adsorption. Particulates are considered a generic state for protein aggregation they are perfectly spherical aggregates whose diameter ranges from hundreds nanometers to few microns. They can be readily formed at high temperature in water solutions at pHs close to the isoelectric point and have never been related to pathologies.

We used spectroscopy and microscopy methods to characterize the aggregates formation, structure and morphologies. Inductively coupled plasma Optical Emission Spectroscopy (ICP – OES) and Differential Pulse Anodic Stripping Voltammetry (DP-ASV)techniques are used to evaluate uptake/release of metal ions in different conditions as a function of time and of adsorbate – adsorbent ratio in kinetic and thermodynamic experiments. The most used kinetic and isotherm equations were used to fit experimental data in order to obtain information about adsorption mechanism.

Changing aggregation conditions and in turn molecular properties of aggregates, it is possible to highlight peculiar structural features essential for metal binding/adsorption. This knowledge can be used to develop efficient biomaterials for removing toxic heavy metal from wastewater, also, to exploit them for several cycles of purification with minimal reduction in performance.

#P002 - SPONTANEOUS INTERFACIAL FRAGMENTATION OF INKJET PRINTED OIL DROPLETS AND THEIR ELECTRICAL CHARACTERIZATION

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This work presents the fabrication of femtoliter-scale oil droplets by inkjet printing based on a novel mechanism for the spontaneous fragmentation at the interface with an immiscible water phase and the electrical characterization of the resulting immersed "daughter" droplets. [1] In particular, picoliter-scale fluorinated oil droplets impact on surfactant laden water phase at moderately high Weber number (10^1), and are subjected to spreading and capillary instabilities at the water/air