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Organization dynamics during protein adsorption on thin silica layers containing silver nanoparticles

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Research and development of new biomaterials has considerably increased in the last decade. Due to the exposure and interaction of proteins with non-biological organic and inorganic solid surfaces the current strategies involve also revealing the relationship between protein structure and function. Regardless of the targeted application, whenever a foreign material is brought to a contact with blood or physiological fluids one of the first process to occur is protein adsorption on the material surface. The conformation and arrangement of the adsorbed proteins further control the subsequent biological processes and thus determine the biological response to the material. To understand the driving mechanism of protein adsorption on solid surfaces we follow the organization dynamics of proteins deposited in two ways: by droplets or by dip coating, on silica layers without or with embedded silver nanoparticles (AgNPs). It is found that droplets containing proteins entail Marangoni effect during drying which in turn leads to concentration of the proteins on the droplet borders while the dip coating process provides thin protein layers which are homogeneously distributed on the solid surface although their continuity depends on the concentration of proteins in the solution. The presence of AgNPs alters the observed physical phenomena.