

Federico Gillio (2002-2005)
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The interaction of proteins with the surface of quartz particles may involve different phenomena: the adsorption of the proteins at the surface of the particles, the modification of the proteins conformation, the oxidative damage of the protein mediated by free radicals generated at the surface of quartz and the modification of the quartz surface itself. In this study we investigated the interaction of albumin and lysozyme, two proteins present in the lung lining layer, with different silica dusts. At physiological pH these two proteins differ in the isoelectric point exposing albumin a negative charge and lysozyme a positive one. They differ also in their internal stability: albumin is easily deformable (soft protein) whereas lysozyme is not (hard protein).

We evaluated the amount of albumin adsorbed on two silica samples: a commercial quartz and an amorphous pyrogenic silica. They have been chosen because the former is cytotoxic and carcinogenic, whereas the second one is not. These two samples differs in several physico-chemical properties such as the bulk structure, the presence of metal impurities, the hydrophilicity and the size. We investigated the role of these properties in the entity of albumin absorption.

The adsorption of lysozyme on some silica samples was also studied.

The conformation of the two proteins adsorbed on commercial quartz and some amorphous silica samples has been also studied by means of the Fourier transform infrared spectroscopy and the differential scanning calorimetry.

The ability of quartz to cause oxidative damage of the proteins was studied.

We also studied the effect of the adsorption of albumin and dipalmitoylphosphatidylcholine on the reactivity of quartz. Quartz surface is active in radical generation, in particular two radical generating mechanisms have been investigated in our study: the generation of HO• in the presence of H₂O₂ and the generation of CO₂ •- radicals following cleavage the C-H bond of formate. We studied the effect of albumin or dipalmitoylphosphatidylcholine absorption on the capability of these dusts to release free radical.