Adsorption of Silver Nanoparticles on the surface of Metal Organic Frameworks

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During last decade engineered nanoparticles are increasingly contaminating waters and natural ecosystems and their possible toxicity to organisms is under careful study. Thus, means of efficient removal of these substances e.g. from waters are highly needed. Recently, metal organic frameworks (MOFs) are considered as potential material for the separation/removing of different contaminants from waters. MOFs have shown potential applications with good achievement in comparison to the traditional porous materials such as zeolites [1,2]. Among engineered nanoparticles, silver nanoparticles (AgNP) are playing more important role as contaminant in aqueous environment [3]. The aim of this work is to study the interaction of silver nanoparticles with selected MOFs.

Silver nanoparticles were synthesized using different reducing agents. Copper based MOF named Basolite^{R} C300 (Sigma Aldrich) with the formula Cu_3 $(btc)_2$ (where btc is 1,3,5-benzenetricarboxylate) was studied as possible sorbent material for the nanoparticles. Different experimental conditions and sorption isotherms were studied. The adsorption isotherm of AgNP on Basolite surface was found nonlinear. When citrate capped AgNP were used in the interaction with Basolite, the formation of dispersed AgNP on the surface MOFs support was confirmed by the SEM analysis (Figure 1) while the incorporation of AgNP within the pores of MOFs was not confirmed. The analysis of the effect of organic ligand group (btc), the pore structure and framework charge on the interaction of AgNP and Basolite surface was studied. The results achieved and methodology developed open the possibility for future studies of the use of different MOFs for removing Ag- nanoparticles from waters.

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References

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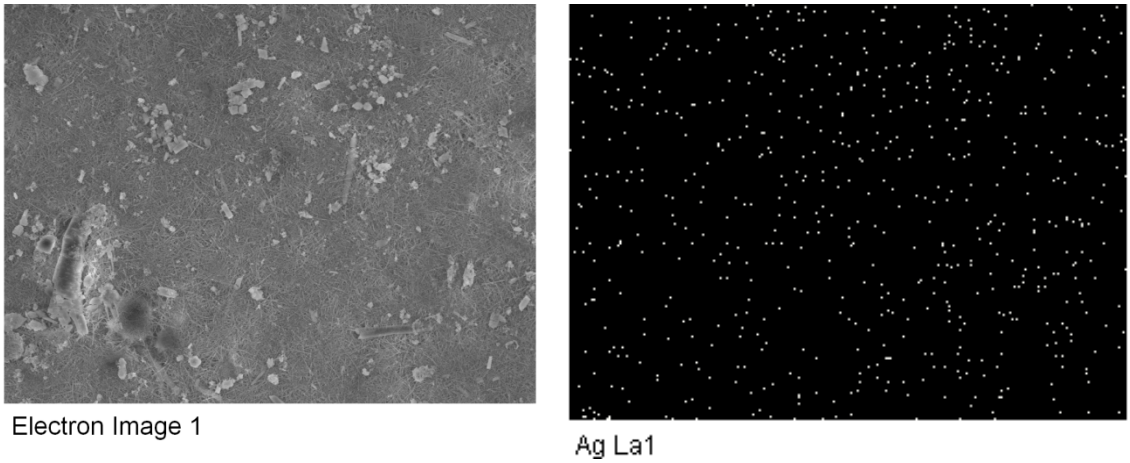

Figure 1 A) SEM image of the sample containing adsorbed AgNP on MOF surface. B) EDX image demonstrating random dispersion of AgNP on the surface of the basolite crystals.