Mesoporous silica materials are characterized by a very large surface area as well as the uniform and ordered porous structure and therefore are very attractive for the possible applications in catalysis. The scientific research focused on their catalytic functionalisation has been related mainly for their modifications with metals and generation of surface acid sites. Despite very intensive studies of this problem any effective method resulting in deposition of metals in highly-dispersed forms (preferably monomeric cations), with the possibly of metal loading control (also in the range of loadings above 10 wt. %) as well as reproducible and cheap (with the perspective for the future scale-up) has not been developed. Due to this problem the preparation of effective catalysts based on mesoporous silicas, especially for the industrial applications, is very limited.

Authors of the project propose to undertake the studies on innovative and cheap method of metal species deposition on the mesoporous silica supports in the form highly-dispersed (mainly monomeric cations) with the control of deposited metal loading. The preliminary studies done by the project authors are very promising and clearly show that the modified method of *template ion-exchange (TIE)* resulted in deposition of copper on the MCM-41 support nearly exclusively in the form of monomeric cations for metal loading above 12 wt.%. According to the authors knowledge deposition of such large amount of metal in the form of nearly exclusively monomeric cations has not been reported in scientific literature. Thus, these preliminary results are very important for development of innovative method for the functionalization of mesoporous silica materials for catalysis. It has to be mentioned that the applied deposition method is relatively cheap, what is important for their possible future application for the production of the catalysts in industrial scale.

The concept of the TIE method is based on the exchange of cationic surfactants in freshly prepared mesoporous silica for hydronium cations or metal cations. It has to be notice that such exchange is possible only for the freshly prepared mesoporous silica materials, because after attaching of protons to the surface $\equiv Si\text{-}O^-$ groups (during calcination or exchange with hydronium cations) the stable $\equiv Si\text{-}OH$ silanol groups, which do not exhibit ion-exchange properties are formed. Unfortunately, the number of scientific reports related to TIE method is very limited. Moreover, there is a leak of any systematic studies optimizing TIE method, at least for one metal. It is hard to be surprised, taking into account that the classical TIE method results in deposition of metals in the form of species with various aggregation of metal oxide phase and therefore the obtained materials are not enough promising for the catalytic applications.

The modification of TIE method used for the copper deposition on MCM-41, proposed by the project authors, is based on using methanol as a solvent of $CuCl_2$ and, what is the most important innovation, treatment of the sample directly after TIE with a solution of ammonia. In the case of post TIE treatment the conditions of this process (ammonia concentration, solvent, duration, etc.) are extremely important. It seems that during ammonia treatment copper cations anchored to the silica surface are complexed by NH_3 molecules, what possibly protects such species against sintering during the subsequent calcination process.

In the opinion of the project authors the preliminary results are very important and therefore the extension of the studies of the modified TIE method for other metals important for catalysis as well as other mesoporous silica supports are proposed.

The main goal of the project is tayloring of the modified TIE method for the functionalization of various mesoporous silica supports obtained with using cationic alkylammonium surfactants (MCM-48, HMS, SBA-2, SBA-6, SBA-8) with transition metals important for catalysis (Co, Ni, Fe, Mn, V, Ti and selected noble metals). Moreover, other important goals of the project are recognition of the mechanism of template ion-exchange for metal cations as well as determination of the TIE process stoichiometry to fully control the amount of deposited metals.