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NEW HIGHLY EFFICIENT CATALYTIC SYSTEMS BASED ON MULTIDENTATE POLYMER PARTICLES, FORMED BY SELF-ASSEMBLY OF CALIX[4]ARENES*

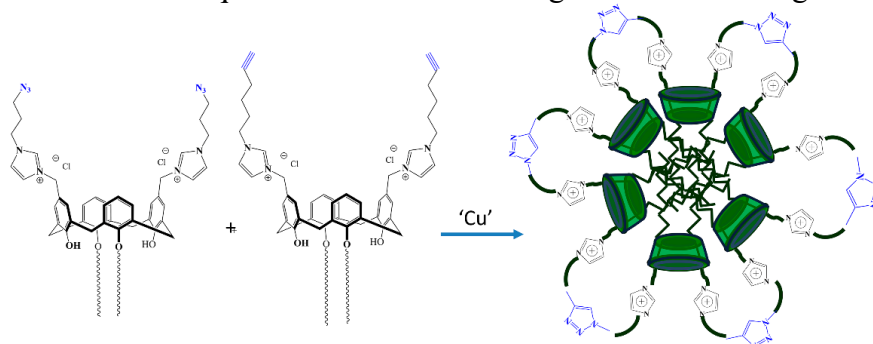
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Abstract. Metal complex catalysis, allowing modification of molecules with atomic precision, leads to a significant saving of resources and by-products decrease and, therefore, completely corresponds to several principles of “green chemistry”. However, it should be worth considering that homogeneous metal complex catalysts can be used only once. Taking into account the high cost of noble metals, the use of homogeneous catalysts becomes a very expensive procedure, especially in industrial scale.

In recent decades, this problem has been successfully solved by anchoring effective catalytic systems on a support, which makes it possible to use them in reactions many times. Typically, in supported catalysts a catalytic act occurs on the surface of the catalyst without engaging the support itself. However, nature itself offers a slightly different model of an effective catalyst. If we look at the functioning of metalloenzymes, catalytic transformations occur in an active “pocket”, the functions of which, in addition to directly chemical transformation, include the binding of substrates and their corresponding orientation. Thus, the presence of “pockets” can give a significant increase of activity and selectivity. Considering the above, the nature of the support plays an important role in the activity and selectivity of the final catalyst. The use of macrocycles having a hydrophobic cavity for the design of metal complex catalysts provides a large surface area and the presence of reaction “pockets”. Macrocyclic amphiphiles allow to form the “core” of the particle using self-assembly in aqueous solutions, and the presence of appropriate functional groups in the macrocycle allows subsequent covalent crosslinking to fix the resulting “core”.



Scheme 1. Representation of covalent fixation of calixarene aggregates using “click” approach.

In this talk, it will be discussed the design and synthesis of bifunctional macrocyclic compounds, combining an amphiphilic motif with functional groups for covalent fixation, which can form stable colloids in aqueous solutions and development of a synthetic procedure for the multidentate NHC carriers based on the self-assembly of macrocycles and further covalent fixation of the aggregate in aqueous solutions. Obtained NHC carriers can act as multidentate ligands – carriers for catalytically active d-metals and was used in catalysis.

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