Ordered nanoporous material: properties and perspectives of applications

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Nanoporous materials, based on porous coordination polymers (Metal-organic frameworks, MOFs) or periodic nanoporous silicas (PNS) prepared by self-assembly of surfactant molecules have attracted considerable scientific interest in recent years. These materials are structurally well ordered with very well-defined pore sizes and exhibit unique physico-chemical properties determined by their high surface area, large pore volume, and the possibility of their modifications. These properties make MOFs and PNS suitable for applications in the fields of catalysis, adsorption, magnetism, or as drug delivery systems. The aim of the lecture is to give an overview of current trends and perspectives in the research of above mentioned classes of nanoporous materials.

The lecture will focus on four areas. In the first part, synthesis strategy and unique structural features of MOFs and PNS will be presented, including their topology and possibility of modification. The second part of the lecture will be dedicated to the use of nanoporous materials for sorption and separation technologically relevant gases. Very highly porous MOFs and PNS offer a variety of chemical compositions and structural architectures that are suitable for the adsorption and storage of gases like hydrogen and carbon dioxide [1, 2]. Third part of the lecture will focus on the use of nanoporous materials as drug delivery systems. PNS materials possess favourable chemical properties, high porosity, stability and biocompatibility and thus are very promissing in drug delivery [3]. Final part of the lecture will be devoted to magnetic properties of MOFs and composite PNS, containing magnetic nanoparticles. The pehnomena like magnetocaloric effect and superparamagnetism will be presented [4].

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