One-pot synthesis of advanced aminosilicas for environmental remediation

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The ecological crisis is a global problem of the 21st century. The development of effective technologies and new smart materials could provide efficient solutions for the overall strategy of cleaning up and minimization the generated pollution. Currently, various aqua environments require drastic improvement in the extraction of metals, organic compounds (e.g. dyes) and water disinfection. Recently, silica materials with amonipropyl groups (spherical particles, xerogels etc.) have become commercial products produced to adsorb some heavy metals, dyes, lipids, mycotoxins, or pesticides[1]. The next step is to change the chemical structure of the surface and porosity of spherical silicas with amino groups to improve the sorption characteristics of such materials and introduce additional adsorption centres into the surface layer. Therefore, we synthesized (using one-pot technique) and studied various silica microspheres containing primary and secondary amino groups, as well as combinations of amino groups with methyl or phenyl groups on the surface and ethylene or phenylene bridges in the structure of silica network[2]. These samples were used to carry out adsorption of metal ions (copper(II), europium(III)), and organic dyes (methylene blue, acid red 88, fluorescein). It can be concluded that the sorption capacity for metal ions depends on the content of functional groups and their availability, whereas the adsorption of dyes relates to the hydrophobic groups on the particles surface. The analysis of antibacterial properties also showed that additional hydrophobic groups on the surface of silica particles may increase the number of contact sites between the bacterial cells and the surface of the particles, slowing down the bacterial reproduction.

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References

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