

Bioactive-metal-containing zeolites

Tsitsishvili Vladimer

Petre Melikishvili Institute of Physical and Organic Chemistry, Georgia



Abstract

The industrial, agricultural, environmental, sanitary and medical use of zeolites ($\text{Me}_n\text{SixAl}_n\text{O}_2(n+x) \cdot m\text{H}_2\text{O}$, Me = Na, K, ... $\frac{1}{2}\text{Ca}$, $\frac{1}{2}\text{Mg}$, ...) is due to the complex of their properties, among which an important place is occupied by the ability of zeolites to enter into ion exchange reactions with the participation of Me^{+n} ions compensating the negative charge of the crystal lattice constructed from SiO_4 and AlO_4 – tetrahedra. Utilization of the natural zeolites for detoxification of living organisms and in water treatment has increasing interest due to their availability and low cost. At first, most of the studies in this area were concentrated on the use of clinoptilolite in the removal of heavy metals. On the other hand, started at the beginning of the 21st century and continuing to this day, studies showed that natural and synthetic zeolites exchanged by ions of silver, copper, zinc or some other transition metals exhibit antimicrobial activity toward a broad range of microorganisms. It is believed that the porous zeolite structure enables metal cations to move freely from the lattice to the environment, and this seems to be responsible for their activity toward microorganisms, but it has recently been established that in some cases the antibacterial activity could be attributed to the bioactive-metalcontaining zeolite (BMZ) itself. BMZ formulations can be combined with various materials used in manufacturing medical devices, surfaces, textiles, or household items where antimicrobial properties are required. Other problem that can be solved by application of BMZs is possible microbiological contamination of zeolite sorbents used in the remediation of hazardous heavy metal-polluted soils or in the purification of industrial wastewater; in such cases it is necessary to provide the sorption materials with bacteriostatic properties in order to prevent the growth of microorganisms on their surface. This talk will discuss a possibilities of obtaining BMZs with a high content of target bioactive metals on the basis of various natural, synthetic and modified zeolites, the structure and properties of different BMZs, as well as possible causes of the bactericidal activity of BMZs at low levels of metal removal from them.

Biography

Vladimer Tsitsishvili, Dr. Physical Chemistry, has his expertise in various fields of Physical Chemistry and Chemical Technologies. He has developed a new concept, a model of a heterodynamic system for describing relaxation, diffusion and other phenomena in dynamically in homogeneous media. More recently, he has developed new methodologies for preparation and modification of zeolite molecular sieves, adsorbents, ion exchangers, and catalysts. He is author of over 450 papers, 2 books on Physical Chemistry and owner of several patents. He is the Member of the Georgian National Academy of Sciences. He was the recipient of several Awards, including the Georgian Order of Honour (2013) and Prizes of the Georgian National Academy of Sciences (2005, 2018).

Publication

1. V Tsitsishvili, N Dolaberidze, S Urotadze, M Alelishvili, N Mirdzveli, ...Chemistry Journal of Moldova, 2017, 12 (1), 95-101
2. MN 387. V.Tsitsishvili, N.Dolaberidze, S.Urotadze, M.Alelishvili, N.Mirdzveli, Chemistry Journal of Moldova, 2017, 12 (1), 95-101
3. I Rubashvili, M Tsitsagi, K Ebralidze, V Tsitsishvili, L Eprikashvili, ...Eurasian Journal of Analytical Chemistry, 2018, 13 (2), em06

10th World Congress on Chemistry and Medicinal Chemistry | Rome | Italy | 28-29 February, 2020

Abstract Citation: Tsitsishvili Vladimer, Bioactive-metal-containing zeolites, Chemistry 2020, 10th World Congress on Chemistry and Medicinal Chemistry, Rome, Italy, 28-29 February, 2020, 01