VIDEO ARTICLE

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Environmental Application of Porous Materials: From Natural Zeolite to Metal Organic Framework Materials

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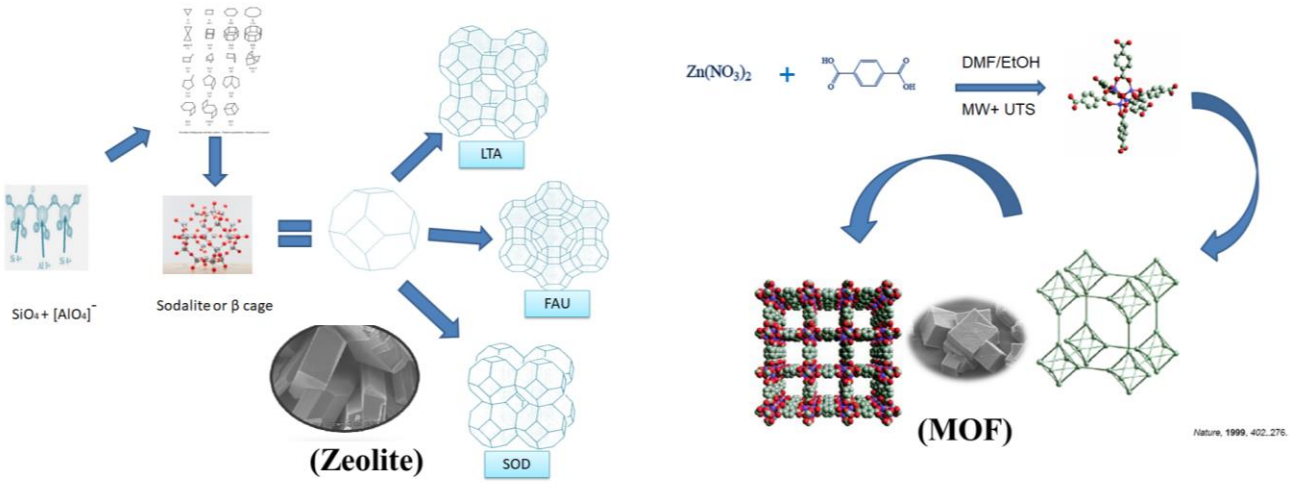
Graphical Abstract



Zeolite and Zeolitic Like framework Materials

Abstract

Environmental pollutions have been serious concerns since industrial revolution. Despite all scientific and technological advancement, because of divers nature of environmental pollutants; developing affordable, yet effective materials for environmental remediation is a challenge. Zeolitic molecular sieves have a wide range of industrial applications that contributes to a very large segment of the global economy. Synthetic zeolites are preferred over their natural counterparts because of their high purity and the possibility of tuning their properties using different modification techniques.

Scientists mimicked zeolite structure by taking advantages of organic linkers and metal clusters in order to synthesize a new class of organo-metallic materials; known as metal organic

frameworks (MOFs). These materials have larger surface areas and great potential for different applications.

In this talk, some of my group's works on environmental applications of porous zeolitic materials from natural zeolite, to synthetic zeolites and MOFs will be presented and discussed. The focus will be on our works in the past 10 years in Canada (since 2010), which are mainly on development of intensified techniques for synthesis of porous zeolitic materials using microwave and ultrasound energies. Furthermore, using MOF-based adsorbents/catalysts for removal of volatile organic compound form contaminated air will be presented and discussed. Currently, we are using different porous natural, synthetic and modified adsorbents (based on zeolite, clay and MOFs) to develop a holistic approach to address lake eutrophication by managing the nutrients (P and N) from their sources and to mitigating toxic compound produced by blue-green algae. Some of my group's recent achievements in this area will be presented and discussed.

Keywords: Zeolite, Metal organic Framework (MOFs), pours material, air pollution, water purification.

Acknowledgements

The data that will be presented in this talk are selected results from different project conducted by my former and current research groups team members in Iran and in Canada. I would like to acknowledge the outstanding contribution of all of my students and colleagues who helped me in passionate journey on porous materials and their environmental applications. Some of them have been working with me since 1999 in Iran (e.g., NSRTI and Science and Technology Park of Tehran University) and since 2009 when I moved to Canada (e.g., Western University-UWO-, and The University of Northern British Columbia–UNBC). The support of the Natural Sciences and Engineering Research Council of Canada (NSERC) through Discovery Grant [funding reference number RGPIN-2019-06304] and numerous funding from MITACS Canada through its "Accelerate" and "GlobalLink" awards is deeply appreciated. Since 2015, the UNBC office of Research technical support to secure numerus funds/grants for my group's ongoing research projects has been invaluable!

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Biography of Presenting Author

Hossein Kazemian is a chemist with many years of experience as a senior analytical, environmental and material chemist and a team leader in both academia and industry. He has extensive background on manufacturing (synthesis), characterization of porous material and nanomaterials including but not limited to metal organic frameworks (MOFs and ZIFs), zeolitic materials (synthetic & natural) and their environmental applications (for water, air and soil remediation processes). Hossein's research interests include: water and waste water treatment; air pollution measurement and control; soil remediation and nutrient removal. He has developed several technology-based processes (up to pilot scales) and products (up to prototypes) and also directed industrial scale projects. Hossein is serving as a member of editorial board of several international journals and as a member of scientific board of many international conference.

He has taught several chemistry courses such as analytical chemistry, general chemistry, material and environmental chemistry and facilitated many technical & scientific workshops. He has published many scientific articles including more than 120 papers in peer-reviewed journals.

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