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Christopher J Rhodes

Fresh-lands Environmental Actions, UK

Zeolites: Fundamental features and environmental implications

A critical overview is presented of zeolites and their use in practical applications. Specifically considered are their roles as media for selective light-induced oxidations of organic molecules using molecular O_2, and the relationship between this phenomenon and the surface electric fields that exist in zeolites. Methods for determining the strength of the zeolite surface fields are discussed using sorbed molecules such as CO with IR detection, and the spin-probes, di-tert-butyl nitroxide and NO, as detected using EPR spectroscopy. The relationship between these surface fields and molecular reorientation energetics for organic free radicals sorbed in zeolites, obtained using muonium as a spin-label, is explored. Finally, results obtained from exposing the naturally occurring zeolite, clinoptilolite to high energy electrons as a means for activating the material toward the selective removal of radioactive caesium and strontium cations from the wastewaters of nuclear power plants are presented.

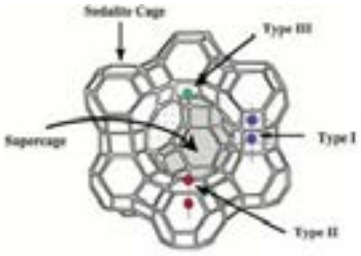

Figure 1: Structure of faujasite with central supercage surrounded by sodalite cages, along with cation sites.

Recent publications

1. Rhodes C (2017) Magnetic Resonance Spectroscopy. Science Progress 100:241-292.
2. Rhodes C (2017) The imperative for regenerative agriculture. Science Progress 100(1):80-129.
3. Propac P, Jomova K, Simunvova M, Kollar V, Rhodes C and Valko M (2017) Targeting free radicals in oxidative stress-related human diseases. Trends in Pharmacol. Sci. 38(7):592-607.
4. Mazur M, Valko M and Rhodes C (2017) A systematic study of the hydration and drying process of xerogel gels using Cu(II) EPR spectroscopy. J. Sol-Gel Sci. Technol. 82(3):855-861.
5. Rhodes C (2016) Electric fields in zeolites: fundamental features and environmental implications. Chemical Papers 70(1):4-21.

Biography

Christopher J Rhodes is the Director of Fresh-lands Environmental Actions. He has catholic scientific interests which cover radiation chemistry, catalysis, zeolites, radioisotopes, free radicals in biology and medicine, electron paramagnetic resonance spectroscopy, and more recently have developed into aspects of environmental decontamination and low-carbon energy production. He has published more than 230 peer-reviewed scientific articles and six books. He is also a published Novelist, Journalist and Poet. His novel *"University Shambles"* is available in both print and e-book versions, and was nominated for a Brit Writers Award: Published Writer of the Year.

cjrhodes@fresh-lands.com