Emerging organic pollutants removal from water using high silica zeolites

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Zeolites are environmentally compatible crystalline aluminosilicates, which have well defined micropore dimensions and composition in a rigid crystal lattice. The shape of their internal pore structure can strongly affect their adsorption selectivity toward host molecules [1-3]. In the present work, organophilic synthetic zeolites which are cheap and available on the market, differing in topology, channel systems and free window apertures, and emerging organic contaminants (i.e. pharmaceuticals, fuel-based-pollutants) differing in chemical properties and molecular dimensions, were tested. A combined diffractometric, thermogravimetric, and gas chromatographic study was used to: (i) measure the sorption capacity of hydrophobic zeolite materials weighed against organic pollutants dissolved in water; (ii) quantify aspects of their removal efficiency for potential use in wastewater and groundwater remediation; (iii) understand zeolite structural features for the adsorption of emerging organic pollutants from aqueous solutions. Coupling the information gathered from these approaches can help in selecting adsorbent materials for water treatment.

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Nitrogen isotopes in lunar soils: A record of contributions to planetary surfaces in the inner solar system

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The nitrogen isotope composition of inner planets ($\delta^{15}N$ = 0 ‰ for the terrestrial atmosphere) and meteorites (between -40‰ and +40‰ for most meteorite clans) differs drastically from both Solar ($\delta^{15}N$ = -386 ‰ [1]) and Cometary ($\delta^{15}N$ ≈+800 ‰ for CN and HCN) values. On Earth, $^{15}N/^{14}N$ ratios span over less than 40 ‰. In contrast, values measured in lunar soils and rocks vary by up to 400 ‰. Since trapped lunar noble gases are exclusively sourced by the solar wind, these variations were initially interpreted as a temporal evolution of the solar wind N isotope composition [2]. Ion probe measurements and N-Ar systematics of soil grains have shown that these N isotope variations instead result from mixing between light N from the solar wind and a ^{15}N-rich component of non-solar origin [3,4]. The latter could have originated from implantation of ancient atmospheric N from the Earth, when the terrestrial magnetic field was weaker than Today [5]. However, the analysis of fluid inclusions in 3.5 Ga-old quartz is consistent with a N content and isotopic composition of the Archean atmosphere comparable to modern values [6], which suggests that the terrestrial magnetic field was strong enough to retain atmospheric N since at least 3.5 Ga. Thus escape of atmospheric N should have occurred before 3.5 Ga ago, e.g., in the Hadean, which is difficult to reconcile with the exposure ages and antiquities of lunar soils generally lower than 2-3 Ga. The secular varations of the N isotope composition of lunar soils are better accounted for by mixing solar wind N with asteroidal (IDPs, micrometeorites, meteorites) nitrogen, and temporal N isotope variations are consistent with a marked increase of the meteoritic flux in the last few hundreds of Ma. The N isotope systematics of lunar soils permit to constrain the fraction of cometary impactors to less than 13%, and the water flux to the lunar surface to about 600 tons/yr [7].

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