Physicochemical Characterization of Zeolite Nanoresin for PFAS Removal and Water Purification

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Per- and polyfluoroalkyl substances (PFAS) are emerging water contaminants of concern due to their toxicity and persistence in the environment. Zeolite nano resins (ZNR) are a promising new material for removing PFAS from water. In this study, we quantify the effectiveness of a new powdered version of ZNR in comparison to its grain counterpart. It was hypothesized that the change in the physical form of the ZNR would increase the absorbance rate. PFAS was modeled using fluorescence. Using the most recent ZNR available kinetic and adsorption isotherm experiments were performed. The tests consisted of ZNR in its grain form and a powdered form in which the known amounts of materials were placed in each aliquot and then incubated until they were analyzed. Each sample was analyzed using a UV-visible spectrophotometer to find out how much the ZNR absorbed. Compared to Grain ZNR which has a rate constant of 2.7069 * 10^-5 * t + 1.1007 the powdered version had a greater rate constant of 8.2458 * 10^-5 * t + 0.015255. While the powder had an absorbance of 6.04 mg of Fl- per gram of ZNR. This study showed that zeo-sand (powdered version of ZNR) is approximately 4 times faster at absorbing contaminants in comparison to grain ZNR. The physical change in ZNR however did not change its adsorption capabilities as the zeo-sand absorbed around the same amount as the grain did. Further experiments will clarify the rates at which PFAS and other contaminants can be adsorbed using zeo-sand.