EFFECT OF THE GRAIN SIZE OF THE YELLOW RIVER SEDIMENT ON ADSORPTION OF CADMIUM IONS

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Sediment samples from the sediment-detention basin of the Zhengzhou water company, which uses the Yellow River water as its water source, were collected and sieved. Their grain sizes range from less than 0.010 mm (D_1), 0.010 mm to 0.025 mm (D_2), 0.033 mm to 0.074 mm (D_3) and 0.074 mm to 0.149 mm (D_4). Organic matter contents in each of them were measured and their order in contents is $D_1>D_2>D_4>D_3$ with the largest being 3.0% and the smallest being 0.95%. Systematic experiments were conducted to study adsorption capacities and adsorption rates of cadmium ions on these sediment samples. Adsorption quantities and adsorption rates of cadmium ions onto different size sediments are significantly different, and determined by and positively proportional to the content of active adsorption components in the sediments. When assessing adsorption abilities of heavy metal pollutant onto sediments, much attention thus should be paid to non-uniformity of sediments in natural rivers, with the same emphasis on adsorption contents of different size sediments and their relative contents in the sediments. In the light of common experimental conditions (batch reactor), a set of equations for describing variations of the dissolved cadmium concentration and the particulate cadmium concentration with time was formulated by the use of adsorptive reaction kinetics equation of heavy metal pollutants, mass balance equation and corresponding initial conditions. Associated with kinetic adsorption experiments, it was found that coefficients of adsorption rates of different size sediments are significantly different and their order is $D_1>D_2>D_4>D_3$, which is in the same order as the organic matter content. Generally, adsorption equilibrium on fine sediments with high content of active adsorption components achieves more quickly. Therefore, it is important to differentiate experimental systems with fine sediment particles and those with coarse ones when carrying out dynamic adsorption experiments.

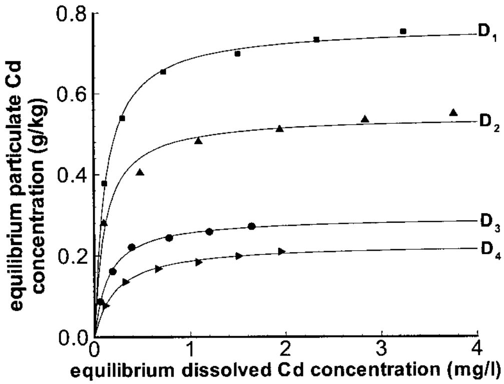

Fig.2 Langmuir adsorption isotherm lines

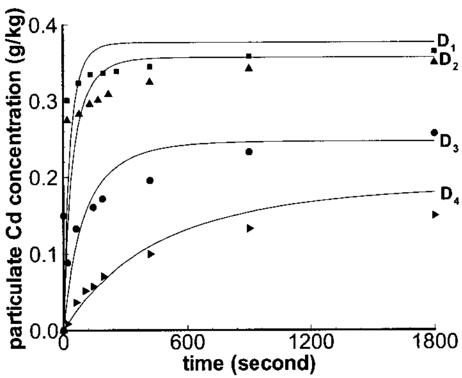

Fig.3a Variation of particulate Cd concentrations with time in Run 1

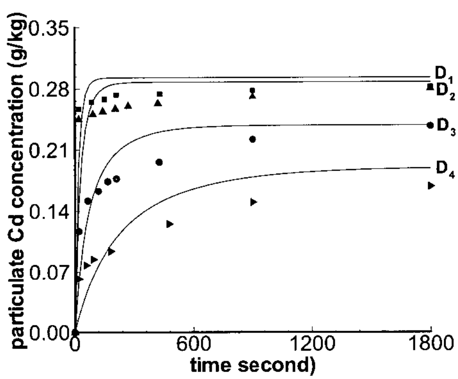

Fig.3b Variation of particulate Cd concentration with time in Run 2

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