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Modeling the Adsorption of Phenols and Nitrophenols by Activated Carbon using Genetic Programming

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Abstract

The process of adsorption of phenols and nitrophenols by activated carbon is one of the most important types of wastewater treatment. However, there is a lack of a general analytic method to predict the adsorption efficiency under different operating conditions. This work studies a data driven approach towards modeling the adsorption process, taking as input the type of contaminant, the pH level, the initial concentration and the elapsed time, in order to predict the adsorption efficiency. In particular, this work is the first to use genetic programming (GP), an evolutionary computation paradigm for automatic program induction, to address the stated modeling problem. Two recently proposed GP algorithms are used and compared with other regression techniques, using real-world experimental data collected under typical operating conditions. Results show that GP enhanced with a local search operator (GP-LS) achieves the best results relative to all other methods, achieving a median performance of $MSE = 94.14$, $R^2 = 0.92$ and average solution size of 41 nodes. Therefore, this technique constitutes a promising framework for the automatic modeling of the

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