The adsorption of heavy metal by Bornean oil palm shell and its potential application as constructed wetland media

Abstract

Oil palm shell, a waste from palm oil industry, was cleaned and utilized as adsorbent. Its particle size distribution gave the uniformity coefficient of approximately two indicating that it can be used as filter bed media for continuous operation without resting. Its measured pH pzc of 4.1 is below the common pH of constructed wetland water body suggesting positive adsorption for heavy metal. The effect of various parameters on its adsorption was studied via batch experiments. The adsorption of Cu(II) and Pb(II) ions by oil palm shell showed a slightly better fit with the Freundlich compared to Langmuir. Its monolayer adsorption capacities were found to be 1.756 and 3.390 mg/g for Cu(II) and Pb(II), respectively. High correlation coefficient of over 0.99 given by the pseudo-second-order model suggests that the rate limiting factor may be chemisorption. These findings suggest its potential application as constructed wetland media for the removal of heavy metal.