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Application of agricultural residues in Supplemented refinery of industrial wastewater

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In this work two agricultural residues, rice hull and sawdust, were examined as sorbent to remove heavy metals Zn, Ni, Cd, Pb, and Cu from wastewater or synthetic solutions. The wastewater samples were taken from Shaheenshahr and Zobeahan wastewater treatment units and from a metal plating factory in Isfahan. To modify the sorption characteristics of rice hull and sawdust, samples were treated by acid, base and heated. The heat treatment converted the residues to char at 400 ^{o}C in the absence of atmospheric O2 .The sorption of heavy metals from the synthetic solutions increased with pH for all sorbents, significantly ($p< 0.01$). The highest sorption capacity was observed for rice hull and sawdust samples, respectively. The modifications changed the sorption capacity of the natural sorbents in the following order: base > heat > natural >acid. pH=5 was selected as the lowest pH with highest mean sorption. At this pH, Pb(II) and Cd(II) showed the highest sorption and Cu(II), Zn(II) and Ni(II) showed the following orders, respectively. The increase of metal concentration in the solution increased the sorption. The basic treated rice hull and sawdust followed by the heat treated rice hull sorbed the maximum of heavy metals from the industrial wastewater samples. In the exoerimental column, the synthetic solutions and the wastewater samples indicated almost the same results as the suspensions. The recovery of the columns using water and HCl showed positive results. Low cost biosorbents are valuable alternatives for commercial sorbents.

Keywords: Rice hull, Sawdust, Heavy metals, Waste water, Completed refinery

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