

The use of waste mussel shells for the adsorption of dyes and heavy metals

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Mussel culture is very important sector of the Greek agricultural economy. The majority of mussel culture activities take place in the area of Central Macedonia, Greece, 60% of total mussel production in Greece producing almost 12 tons of waste mussel shells on a daily basis. Currently there is no legislation concerning the disposal of mussel shells. In the present study the waste shells were used for the removal of dyes and heavy metals from aqueous solutions while powdered mussel shells were added in activated sludge processes for the removal of hexavalent chromium.

Mussel shells were cleaned, dried and then crushed in order to form a powder. Powdered mussel shells were used in standard adsorption experiments for the removal of methylene blue and methyl red as well as for the removal of Cr (VI), Cd and Cu. Moreover the powdered mussel shells were added in laboratory scale activated sludge reactors treating synthetic wastewater with hexavalent chromium, in order to investigate the effects in activated sludge processes and their potential contribution to the removal of hexavalent chromium.

Adsorption experiments indicated almost 100% color removal, while adsorption was directly proportional to the amount of powdered mussel shells added in each case. The isotherms calculated for the case of methylene blue indicated similar adsorption capacity and properties to those of the commercially available activated carbon SAE 2, Norit.

High removal efficiencies were observed for the metals, especially in the case of chromium and copper. The addition of powdered mussel shells in the activated sludge processes enhanced the removal of chromium and phosphorus, while enabled the formation of heavier activated sludge flocs and thus enhanced the settling properties of the activated sludge.