

Role of HSAB concept in understanding biosorptive behaviour of various metal ions employing green biosorbent – Dry Cow Dung Powder

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Hard & Soft Acid Base concept, HSAB theory given by Pearson, elucidates the crucial role of HSAB characteristics of both pollutants as well as the aqueous milieu. This theory can also explain the biosorptive behaviour of Dry Cow dung Powder, which helps in governing the success of process. The various metal ionic species exhibit a preference for the ligand binding on the biomass based on its chemical coordination characteristics.

A comparative batch equilibration biosorptive assay has been carried out employing radiotracer technique for uptake of Cr(III), Cr(VI), Cd(II), Hg(II), Sr(II), Cs(I) and Co(II) at optimum biosorption parameters. To study the effect of interference of different salts on the percentage biosorption of metal ions on DCP, different organic as well as inorganic salts with varying proportion of 10 mg, 25 mg, 50 mg and 100 mg have been studied. The dynamics of the biosorption in terms of the order of the rate constant was studied applying different kinetic models. The best fitting model was Lagergren pseudo second order model.

DCP, an eco-friendly humiresin, enriched with minerals, carbohydrates, fats, proteins, bile pigments, aliphatic - aromatic species such as 'Humic acid', Fulvic acid and many naturally present functional group such as carboxyl, phenols, quinols, amide etc. of both hard and soft nature, making it 'combo' in nature sorbs both concerned metal ions as well as ligands present in the system. Thus the ligands which were masking the biosorption process of heavy metal ions in this study were treated by mere increase in the dose of DCP, which successfully solves the problem without affecting efficiency of the process. This is exemplified by three very basic interactions happening in multicomponent system i.e. Synergism: Mutual enhancement; Antagonism: Mutual decrement; Non-interaction: Neutral effect.

Thus DCP has a great potential in the field of water decontamination, industrial water treatment and in abatement of water pollution. So as to get optimum biosorption with in-situ conditions, it is very important to know the nature of ligands and their concentration present in the effluent. The selection of any process should be considered in the terms of its feasibility and it should also contest, the 3A's concept of affordability, acceptability and adaptability. On this background, our research with DCP proves its affordability by being free and naturally available, its acceptability by HSAB concept and its adaptability by its Combo nature.

References

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