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Utilizing agricultural waste in solid state fermentation for multiple environmental applications

Prachi Kaushik
Indian Institute of Technology Delhi, India

Various waste agricultural residues such as corn cob, wheat bran, wheat straw and sugarcane bagasse have been utilized as the substrate for solid state fermentation by different industrially important fungal isolates belonging to Aspergillus sp. and Rhizopus sp. These fungal isolates have shown promising potential in treatment of dye and heavy metal containing water and wastewater released from various industries. More than 90% removal of various cationic as well as anionic dyes has been achieved using these fungal isolates. Initially xylanase, cellulase and carboxy-methyl cellulase production potential of these fungal isolates was observed on various waste agricultural products through solid state fermentation. Waste agricultural residues such as corn cob, wheat bran, wheat straw and sugarcane bagasse, having considerable contents of hemicellulose and cellulose were selected as the substrate. Nitrogen for the growth of the fungi was supplemented through a low cost optimized media containing urea and ammonium chloride. Enzyme activity for various enzymes was measured through standard protocols after 5 days of incubation at 30°C. After elution of the enzyme, spent fermented slurry was used to study the removal of Methylene Blue dye (cationic dye) and Acid Navy Blue dye (anionic dye) where more than 90% dye removal was achieved in 5h through biosorption. Thus the present technology provides an alternative for the use of waste agricultural residues for dual purpose of enzyme production and waste water treatment.

kaushik.prachi@yahoo.com

The indexes of recyclability for an applied commercial container unit

Luiz Henrique Maccarini Vefago and Fernando Barth
Federal University of Santa Catarina, Brazil

It is well known that reserves of non-renewable resources are limited and that waste emitted into the air, soil and earth pollute the environment. In addition to proposing a change in the architects' way of thinking, the climate change further requires an improvement in the environment, politics and social consciousness. The chase for sustainable architecture must also consider the end of the life cycles of materials. The aim of this work is to analyze the indexes of recyclability of different commercial units made of steel shipping containers and compare to the same commercial unit made of perforated bricks with mortar cladding and concrete structure. The indexes of recyclability introduce new concepts regarding materials and building elements that reach the end of their first life cycle. The research method is based on a hierarchic upside down pyramid that gives priority to the reuse and recycling of materials in the design and deconstruction phases and afterwards allows for the creation of recyclability levels of the materials and elements. The results show that the commercial units made of steel shipping containers present higher indexes of recyclability than the conventional way of construction with bricks. This is caused by the high amount of steel reused in the containers and the higher value given to the reuse materials category than the others. On the other hand, the perforated bricks unit uses virgin materials for its fabrication and these bricks cannot be segregated without damage. In this context, the recyclability of containers allows a sustainable way to design and construct buildings, and it is a step forward to the closed-loop material cycle.

luizvefago@gmail.com