

## **NEW PATENTS IN WASTE TREATMENT (Effluent Treatment)**

### *Water / Effluent treatment*

#### **A process for the purification of Escherichia coli contaminated water for reusable option.**

The present invention provides process for purification of Escherichia coli (E.coli) contaminated waste water using alkali metal sulphide followed by passing through the reactor packed with activated carbon. The treated water can be reused.

The process has enormous potential applications for supplementing the inventory towards recreational water, bath water, industrial cooling water, industrial processing water and agricultural water by sewage, duly freed from E.coli, thereby ensuring reuse of water leading to substantial reduction in fresh water requirement. The process has already been transferred to industry. The invention has been applied for Patent protection (Indian Patent application no. 1110DEL2001; Patent pending).

#### **A process for recovery of salt from salt laden water containing dissolved organics for reusable options**

The present invention provides process for recovery of salt from salt laden water containing dissolved organics using oxidizing agent under acidic condition to remove the dissolved organics. Other chemical and biological impurities present in the water containing salt and dissolved organics can be removed by passing the same through activated carbon of specific characteristics. Water free from dissolved organics, evaporated under sun light provide salts for reusable option. The process has already been transferred to industry. The invention has been applied for Patent protection (Indian Patent application no. 317DEL2004; Patent pending).

#### **A novel catalyst useful for the removal of pathogens from waste water**

The present invention provides a novel catalyst useful for the removal of enteric and other pathogens from waste water. The process relates to the treatment of domestic and industrial waste water contaminated with enteric and other pathogens with metal ion impregnated activated carbon, whereby the pathogens such as Escherichia coli, Shigella species, Salmonella species are completely destroyed during the treatment resulting in no recurrence or regrowth of the organism. Thus the water, treated and purified thereby, can be reused. This process has enormous potential applications for supplementing the inventory towards recreational water, bath water, industrial cooling water, industrial processing water and agricultural water by sewage duly freed from enteric pathogens such as Escherichia coli, Shigella species, Salmonella species, thereby ensuring reuse of water leading to substantial reduction in fresh water requirement.

The invention has been applied for patent protection (Indian Patent application no. 2497Del2005; patent pending). The technology has already been transferred to industry.

#### **A novel third phase electrode for electro-catalytic treatment of waste water**

The invention provides a novel third phase electrode comprising surface etched nickel impregnated mesoporous activated carbon (SENIMAC). The process of waste water treatment with yeast immobilized macroporous activated carbon employs SENIMAC as the third phase electrode in an electro-catalytic reactor. A process is provided for electro-catalytic purification of waste water containing Chemical Oxygen Demand (COD) not more than 50000 mg/l and Total Dissolved Solids (TDS) not more than 70000 mg/l generated from different industrial sectors. The process of the present invention also reduces the treatment cost of wastewater significantly. The treatment process exhibits an efficiency upto 90% and 86% for COD and TOC respectively. The invention has been applied for patent protection (Indian patent application no. 759Del2006; patent pending). The technology has already been transferred to industry.

## **A Microaerophilic Bacterial Consortium and use thereof for the simultaneous Biodegradation of mixture of Recalcitrants present in Water**

The present invention relates to a microaerophilic bacterial consortium and a process for the simultaneous biodegradation of mixture of high molecular weight aromatics that are recalcitrant in nature. By this invention recalcitrant chemicals generated from industrial processes containing aromatic compounds with number of carbon ranging from C3 to C60 with different functional groups namely hydroxyl, methyl, alkyl, aryl, azo, amino, sulfo, chloro, nitro, and thiol are essentially converted into nontoxic biodegradable end products, thereby making the treated liquid suitable for direct disposal without further treatment. This eco-friendly, economically viable process has potential application in all the industries wherever the recalcitrant pollutants are generated as a waste posing a major problem for their disposal, adding thereby to environmental pollution. The process is envisaged to have enormous application in tanning industry, Pharmaceutical industry, Textile industry, chemical manufacturing industry, pesticide production industry, Paper and pulp industry, metal manufacturing Industry. It may also be used for treating the recalcitrant present in domestic sewage. The invention has been applied for patent protection (Indian Patent application no. 3437Del2012).

## **A process for simultaneous reduction of pH and TDS in tannery lime liquor**

Disclosed herein is a biological process for simultaneous reduction of pH and TDS of tannery lime liquor using a bacterial strain of *Micrococcus* sp. designated as MTCC 5899. pH of the treated lime liquor is found to be in the range of 7.5-8.5. The process ensures a reduction of TDS of the lime liquor by 5 - 98%. It is an eco-benign process to ensure that the hazardous lime liquor does not add to pollution load of the environment. The invention finds application in treating highly polluting lime liquor generated by tanning industry. Indian Patent application no. is 2623DEL2014.

## **A process for the purification of Ammoniacal Nitrogen laden water**

Disclosed herein is a process of treating ammoniacal nitrogen laden water with Magnesium hydrogen phosphate, formed in situ by treating phosphoric acid with Magnesium salt, under acidic condition. The struvite crystal generated thereby is separated to obtain water free from ammoniacal nitrogen. The process overcomes the formation of high amount of sludge during the conventional Struvite precipitation process and ensures a removal of ammoniacal nitrogen to the extent of 96.4%. The process finds application for the removal of ammoniacal nitrogen in the effluent of tanneries, textile industries, pharmaceutical industries and chemical industries. Indian Patent application no. is 160DEL2015.

## **Prodigiosin dialdehyde diamine iron oxide composite as disinfectant and a process for preparation thereof**

Disclosed herein is an activated magnetic iron oxide matrix, functionalized with alkene diamine and alkanedial linkage for effective integration of non-leachable Prodigiosin. In other words, it involves conjugation of prodigiosin with magnetic iron oxides through alkene diamine and alkanedial linkage formation. The composite has the potential to kill the pathogens present in contaminated water. The unique feature of the composite is that it can be easily recovered from the disinfected water and the recovered matrix can be reused for the disinfection of water. The matrix finds enormous potential application in the disinfection of municipal and industrial waste water. Indian Patent application no. is 201711022957.

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