BIODEGRADATION OF GASOLINE OXYGENATE METHYL TERT-BUTYL ETHER BY PURE AND MIXED CULTURES

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ABSTRACT

TO INVESTIGATE THE BIODEGRADABILITY OF METHYL TERTIARY BUTYL ETHER, THE RESEARCH FOCUSED ON THE ACCLIMATION AND ENRICHMENT FOR MTBE UNDER CONTROLLED LABORATORY CONDITIONS FROM A MTBE MANUFACTURING PLANT BIOTREATER. ADDITIONALLY, THE NUTRITIONAL AND ENVIRONMENTAL REQUIREMENTS FOR THE MTBE BIODEGRADATION WERE EXAMINED BY A PURE CULTURE OF ENV425 (ATCC 55798) AND A MIXED CULTURE OF UCD. RESULTS SHOWED THAT THE MICROBIAL CULTURE (ENV425) WAS ABLE TO DEGRADE MTBE WHEN GROWN IN A MEDIUM CONTAINING BACTO BEEF EXTRACT. HOWEVER, STRAIN ENV425 WAS UNABLE TO DEGRADE MTBE WHEN GROWN IN A MEDIUM CONTAINING D-GLUCOSE AND BACTO PEPTONE EVEN THOUGH THE OPTICAL DENSITY WAS AS HIGH AS 1.1 IN A D-GLUCOSE MEDIUM. RESULTS FROM A BATCH TEST INDICATE THAT UCD CULTURE WAS CAPABLE TO DEGRADE MTBE IN A MINIMAL MEDIUM. HOWEVER, THE MTBE BIODEGRADATION DECREASED WHEN THE UCD CULTURE WAS GROWN IN A MEDIUM CONTAINING ADDITIONAL NUTRIENTS. IT WAS ALSO FOUND THAT THE MTBE BIODEGRADATION DECREASED AND THE LAG PHASE WAS PROLONGED WHEN ADDITIONAL CULTURES WERE PRESENT. RESULTS OF BATCH SUBSTRATE REMOVAL EXPERIMENTS SHOWN THAT MTBE WAS COMPLETELY REMOVED WITHIN 191 HOURS FOR A MICROBIAL CULTURE DERIVED FROM A MTBE MANUFACTURING PLANT BIOTREATER, OVER A SIX-MONTH ACCLIMATED PERIOD. THE RESULTS FROM ACCLIMATED EXPERIMENTS FOR A LABORATORY-SCALE BIOFILTER REVEALED THAT THE INLET MTBE CONCENTRATIONS AFFECTED THE SUBSTRATE REMOVAL RATES. HOWEVER, THE BIODEGRADATION RATES WERE LOW FOR THE CURRENT BIOFILTER, AND WHICH WAS BELIEVED TO DUE TO THE INSUFFICIENT ACCLIMATION TIME.

Keywords : GASOLINE OXYGENATES, MTBE, BIOFILTER, BIODEGRADATION

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