SYNTHESIS AND EVALUATION OF SOME SURFACE ACTIVE AGENTS DEPENDING ON RECYCLED POLYETHYLENE TEREPHTHALATE AS ANTIBACTERIAL AGENTS FOR METAL WORKING OILS

By

Shady Atef Mansour Abd El Salam

B.Sc. Science (Chemistry & Biochemistry), Cairo University, 2004

A Thesis Submitted in Partial Fulfillment
of
The Requirement for the Master Degree
in
Environmental Science

Department of Environmental Basic Science
Institute of Environmental Studies & Research
Ain Shams University

2013

APPROVAL SHEET

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2013

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بسم الله الرحمن الرحيم
(وقل اعملوا فسيرى الله عملكم ورسوله والمؤمنون)
صدق الله العظيم

"إلهى" .. لا يطيب الليل إلا بشكرك .. ولا يطيب النهار إلا بطاعتك .. ولا تطيب اللحظات إلا بذكرك .. ولا تطيب الآخرة إلا بعفوك .. ولا تطيب الجنة إلا برؤيتك

إلى من بلغ الرسالة .. وأدى الأمانة .. ونصح الأمة .. إلى نبى الرحمة ونور العالمين .. سيدنا محمد -صلى الله عليه وسلم-

إلى من كلله الله بالهيبة والوقار .. إلى من علمنى العطاء بدون انتظار .. إلى من أحمل أسمه بكل افتخار .. أرجو من الله أن يمد فى عمرك لترى ثماراً قد حان قطافها بعد طول انتظار .. وستبقى كلماتك نجوم أهتدى بها اليوم وفى الغد
وإلى الأبد
-(والدى العزيز)-

إلى ملاكى فى الحياة .. إلى معنى الحب .. إلى معنى الحنان والتفانى .. إلى بسمة الحياة وسر الوجود .. إلى من بها أكبر وعليها أعتمد .. إلى من كان دعائها سر نجاحى وحنانها بلسم جراحى .. إلى أغلى الحبايب
-(أمى الحبيبة)-

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AIM OF THE WORK

The main objective of this study is to use recycled Polyethylene terephthalate (PET) polymer in the manufacture of biocides; and to use these biocides in protection of cutting fluids from the bacterial growth.

The objectives of this study are:

1. Recycling the used polyethylene terephthalate (PET) polymer.
2. Preparation of new generation of biocides which based on the functionalization of the recycled PET.
3. Using the prepared biocides to improve the stability of the cutting fluids against the bacterial growth.
4. Retain the tribological properties of the cutting fluids after the addition of the prepared biocides.
5. Evaluation of the cutting fluids after the addition of the prepared biocides in industrial scale.

ABSTRACT

The metal working oils accounts for approximately 5% of the total world market for lubricant. These fluids are used for a variety of operations such as: metal cutting, drilling, milling, cold rolling and broaching.

In this study we use recycled Polyethylene Terephthalate (PET) polymer in the manufacture of biocides for cutting fluids formulations to improve the stability of the cutting fluids against bacterial growth and to increase the economic impact of the cutting fluids.

The Polyethylene Terephthalate (PET) polymer was glycolyzed by (polyethylene glycol) to give the glycolyzed products. The bromoacetate derivatives were prepared by the reaction of the glycolyzed products and (bromoacetic acid). These esters were quaternizing with excess amounts of (triethylamine) and (pyridine) respectively to give the products: (PET400BrT, PET600BrT, PET1000BrT, PET400BrPy, PET600BrPy & PET1000BrPy).

These products were evaluated as biocides for the cutting fluid formulations at concentrations of (0.1%, 0.25%, 0.5%, and 1%). The results of evaluation revealed excellent biocidal activity of the prepared additives against the bacterial growth in the cutting fluids. The tribological properties including: kinematic viscosity, viscosity index, emulsification power, surface tension, specific gravity, flash point, pH value, and rust prevention were measured. The results of measurements showed that the prepared biocides have no effect on the tribological properties of the cutting fluids.

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