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FY91 AASERT - MICROBIAL DEGRADATION OF POLYMERS USED
IN ELECTRONICS

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Dr Ralph Mitchell

dept of Applied Sciences
Harvard University
29 Oxford Street
Cambridge MA 02138-3826

AEOSR-TR. 94 072

AFOSR/NL
110 Duncan Ave Suite B115
Bolling AFB DC 20332-0001

Dr Hedberg

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In a continuation of our work on the biodegradation of polyurethane we are identifying and classifying new organisms isolated from enrichment cultures of polyurethane-contaminated soil from disposal sites. During the past year we have isolated in pure culture a number of bacteria and fungi capable of degrading polyurethane. We are in the process of identifying these microorganisms.

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INTERIM TECHNICAL REPORT

Grant	AASERT Grant / Microbial Degradation of Polymers used in Electronics
Grant Number	F49620-92-J-0254
Principal Investigator	Professor Ralph Mitchell

October 1994

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In a continuation of our work on the biodegradation of polyurethane we are identifying and classifying new organisms isolated from enrichment cultures of polyurethane-contaminated soil from disposal sites. During the past year we have isolated in pure culture a number of bacteria and fungi capable of degrading polyurethane. We are in the process of identifying these microorganisms.

Our bacteria and fungi are being tested as pure cultures and as recombined consortia for polyurethane degradation potential, using electron impedance spectroscopy (EIS) to detect biodegradation of the polyurethane. Gas chromatography is also being employed to determine and identify polyurethane biodegradation products. Distribution of the organisms on polyurethane coated coupons is being examined using scanning electron microscopy.

The effect of surfaces on biodegradation potential has also been examined. During biodegradation microorganisms are exposed to a range of environments. The microorganisms were examined for responses to temperature and pH differences while grown in liquid culture. The ability of attachment of bacteria to surfaces to protect microorganisms from environmental shocks was also evaluated.

The consortium has been shown to attach to granular activated carbon (GAC) by both electron microscopy and epifluorescent light microscopy. The presence of GAC in a reactor did not decrease start-up time. In contrast, the presence of montmorillonite decreased start-up time by approximately 50%, due to the presence of cations on the surface. Both surfaces reduce the negative effects of lower temperature on biodegradation potential. Our studies using scanning electron microscopy showed that the microbial consortium becomes less diverse after long-term attachment to GAC.

We are planning to optimize the environmental conditions for biodegradation of the polyurethane by our microorganisms. We will continue to study the effects of surfaces on the growth and polyurethane-degrading activity of the organisms.

The student being supported by this grant, Jennifer Byrnes, continues to maintain good grades and to be in good standing as a doctoral student at Harvard University.

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