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Sediments have been shown to contain active enzymes that can degrade nitroaromatic compounds such as TNT or chlorinated solvents such as TCE. Five classes of proteins have been isolated and partially characterized. Three of the classes of proteins have been used for the production of monoclonal antibodies to determine the possible sources of these proteins. In every case, the sources are plants growing near the sediment. The use of plants for remediation of hazardous materials such as TNT or other munitions like RDX and HMX has led to a new approach to remediation--phytoremediation. Investigators have developed a field test to indicate which locally grown plants can be used at each contaminated site.

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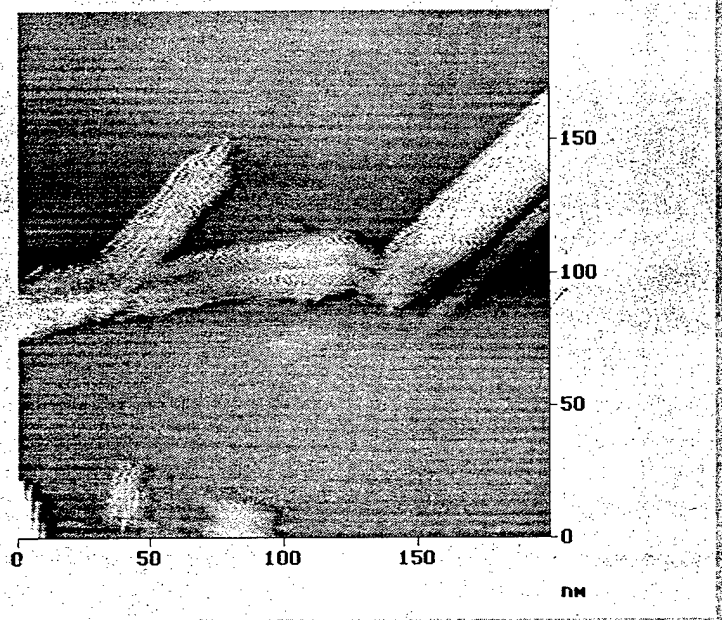

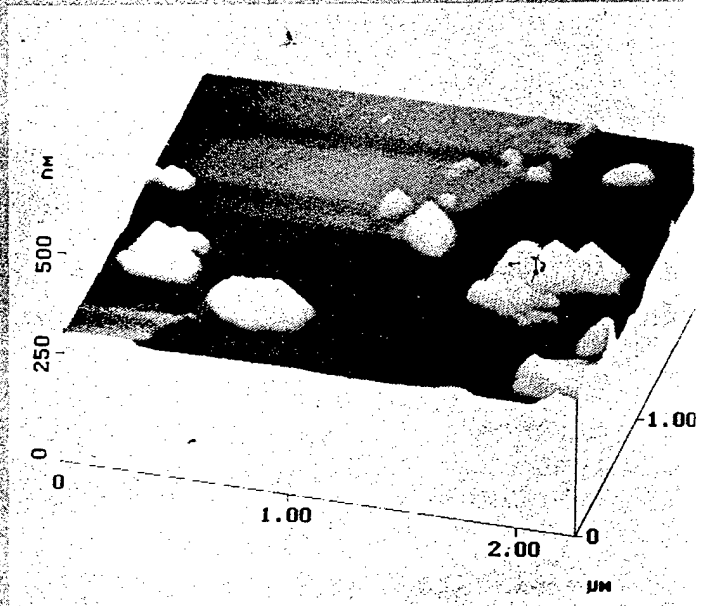

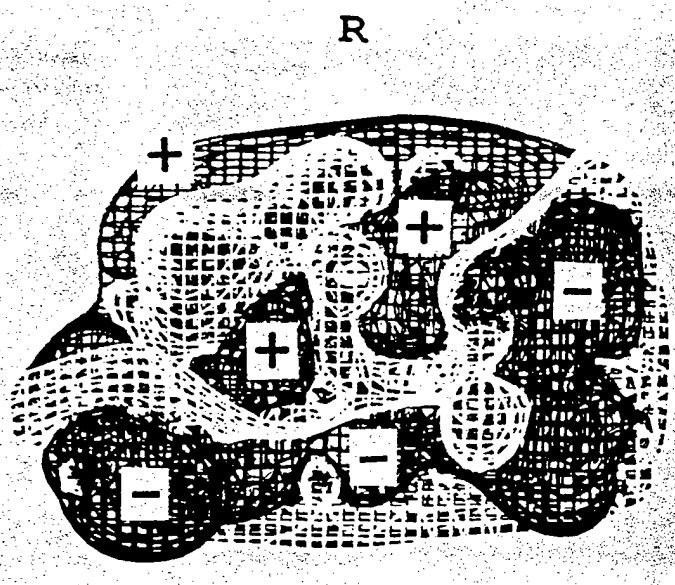

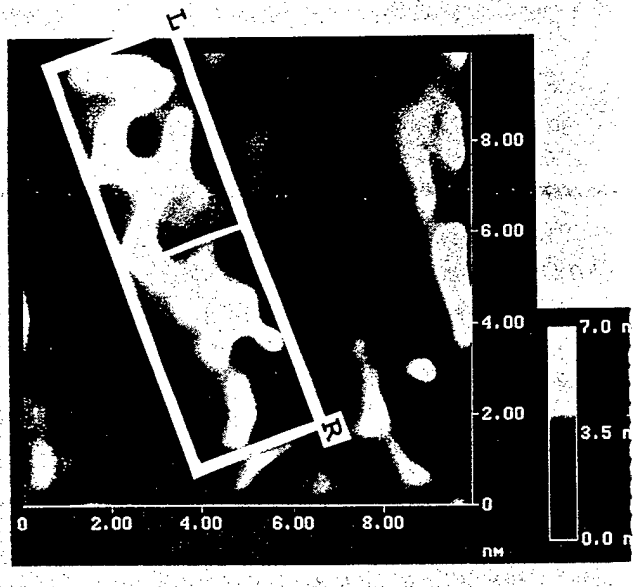

Remediation Using Plants and Plant Enzymes: A Progress Report

Sediments have been shown to contain active enzymes that can degrade nitroaromatic compounds such as TNT or chlorinated solvents such as TCE. Five classes of proteins have been isolated and partially characterized. Three of the enzymes have been used for the production of monoclonal antibodies to determine the possible sources of these proteins. In every case, the sources are plants growing near the sediment. The use of plants for remediation of hazardous materials such as TNT or other munitions like RDX and HMX has led to a new approach to remediation--phytoremediation. Investigators have developed a field test to indicate which locally grown plants can be used at each contaminated site.

Pilot scale testing of the concept of phytoremediation is being funded by the Strategic Environmental Research and Development Program. Created wetlands containing appropriate plants will be used to remove TNT from ground water.

TNT half life of minutes

Halflives of TNT with the appropriate plants are on the order of minutes in the laboratory compared with 15 to 20 days for composting and 80 days for bacterial breakdown. Investigations have shown that the TNT is reduced one nitro group at a time to triaminotolune (TAT) by one enzyme, a nitroreductase. A second enzyme present in some plants, a lactase, adds oxygen across the ring structure and opens it up. The reaction after ring opening is very rapid, and no TNT remains, and the components of the TNT molecule may be incorporated into the plant, perhaps as lignin.

Phytoremediation is also applicable to the cleanup of TNT-contaminated soil. Auburn University, in cooperation with EPA, has conducted a series of batch pilot studies at an abandoned ammunition plant in Alabama. The Georgia Institute of Technology, Rice University, and Louisiana State University will conduct soil cleanup pilot studies in 1995 using soils contaminated up to 5000 ppm, under an EPA grant to the Hazardous Substance Research Center/South and Southwest. *(N.L. Wolfe and S.C. McCutcheon; 706-546-3429)*