November 1974
B74-10210

NASA TECH BRIEF

NASA Pasadena Office

Polymers Used to Absorb Fats and Oils: A Concept

Doctors and dieticians persistently warn us to restrict our daily intakes of oils and fats to prevent obesity and heart disease. Environmentalists are arguing about petroleum oil that pollutes the oceans, destroying wildlife and miles of beaches. One approach to both of these problems is to develop a method by which the oil is absorbed into a solid mixture. Undigested fats and oils would then be eliminated as solid waste; the water-insoluble oil-containing solid could be mechanically removed from the oceans.

The materials proposed for these purposes are cross-linked (network) polymers that have high affinity for aliphatic substances, i.e., petroleum, animal, and vegetable oils. Network polymers that contain unsaturated hydrocarbons, mixtures of saturated and unsaturated hydrocarbons, or certain polyethers absorb up to 20 grams of oleic acid per gram of dry polymer and 25 grams of mineral or vegetable oil per gram of dry solvent. Of course, any application of these polymers involving the human diet would require extensive study of their overall effects and toxicity.

The absorption occurs because of the chemical similarity and mutual affinity of the oils and the polymers. If, however, the polymer is thermoplastic (not cross linked), oil will be absorbed by the polymer to such an extent that the mixture becomes essentially polymer dissolved in the oil. In that case, the mixture often reverts to a liquid. Network polymers, on the other hand, absorb only that amount of oil that can be contained within the interstices between the cross-linked chains. Because the cross-linking chemical bonds are covalent, like the intrachain bonds, the swollen polymer retains its spacial structure and thus its solid character.

General criteria for selection of an oil-absorbent dry polymer are:

a. The polymer should be a network polymer.
b. It must be chemically stable in the environment in which it is to be used.
c. The cross-linked chains in the polymer should be long.
d. The polymer should have an affinity for oils and fats.
e. The chains should be in amorphous state.

Note:

Requests for further information may be directed to:

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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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under contract to
NASA Pasadena Office
• (NPO-11609)

Category 05, 04