The impact of various organic solvents on the solubility of polyester compounds

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Abstract

Plastics are organic polymers created through the polymerization of long hydrocarbon chains. Because of their high durability, plastics persist in the environment for a long time. One effective method to break them down and convert them into simpler materials is to use a suitable solvent that alters their structure. Some solvents can break down the structure of a plastic, while others may soften or distort it. The type of plastic and contact time with the solvent also matter. In this study Dimethylformamide (DMF), Dimethylsulfoxide (DMSO), Phenol, Trifluoroacetic acid (TFA), Dichloromethane, Chloroform, and Toluene were utilized in quantities of 2 ml to assess dissolution rate of small pieces obtained from plastic bottles, which are considered as a source of polyester plastics. Furthermore, constant stirring, boiling the solvent, and the application of heat and time were found to be able to enhance solubility. Results showed that polyester polymers can be transformed from solid to liquid when they're exposed to suitable solvents. Trifluoroacetic acid (TFA) is the most effective one, able to depolymerize bottles by 50% and dissolve films due to its acidic nature, particularly at high temperatures. Chloroform has 40% solubility, while Toluene has a lower solubility. Phenol and Dimethyl sulfoxide (DMSO) each have 20% solubility, Dichloromethane and Dimethylformamide (DMF) have 10%. Based on our results, Trifluoroacetic acid can be used as the best solvent for polyester degradation.

Key words: Organic Solvents, Solubility, Polyester, Plastics

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