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Endocrine Disruptors Contained in Synthetic Polymer (4)
A Novel Method for Polystyrene Reaction at Low Temperature

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[Introduction] Polystyrene (Pst) is used in great quantities for making containers for food and medical products. Styrene monomer as a constituent in such containers may enter foodstuffs and thus study was made for the clarification of this point and to determine the potential for toxic effect on the human body. The metabolism, carcinogenicity and mutagenicity of metabolites of the monomer have been studied in detail. The dimer and trimer in addition to the monomer may also pose serious health problems as endocrine disrupters and this has prompted concern over plastic food containers, which contain these polymers. Low molecular weight compounds (oligomers) always present in Pst have been actively studied for clarification of possible toxic effect on the body.

Heat treatment at less than 250℃ may load to oligomer production in ultra trace amounts from Pst or 1% less the original weight of Pst. The authors established a new method for conducting the thermal decomposition of Pst at low temperature and detection of ultra trace oligomer. Pst decomposition was found to occur at low temperature, such as that of softening point. The present method was found applicable to other plastics for the identification of endocrine disruptors and the mechanism for their generation.

[Material] Pst (Denkastyrol) in this study was a commercially obtained unmolded pellet from which oligomer component had been removed as much as possible by reprecipitation. The Pst was then subjected to 10 days drying in vacuo(3mmHg) at 25℃.

[Results and Discussion] Monomer, dimer and trimer constituents entered the new heating medium with the course of Pst thermal decomposition. Pst is thus shown to immediately come in contact with the medium and decomposed. Heating of the entire sample is uniform. There was virtually no occurrence of side reactions owing to the presence of N_2 gas.

Product separation was then conducted by using a benzene/water system. The benzene layer was treated with methanol and Pst was precipitated and removed. It is thus evident that the separation and identification of all low molecular weight compounds from Pst decomposition are possible at low temperature. Pst decomposition can be seen to start near 190℃. The thermal decomposition occurs at less than the softening point temperature. Trimer, dimer and monomer quantities decreased in this order. Pst is shown by the present study to undergo decomposition in the molding process, to reading produce substances that punition as endocrine disrupters at low temperature.