

## **CHEMICAL DECOMPOSITION OF PLASTICS IN MICROWAVE FIELD – NEW WAY HOW TO RECYCLE PLASTIC WASTE**

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In spite of numerous ways of chemical recycling of plastic waste, only a very limited number have been used in industrial scale. The reasons for this phenomenon are quality problems, economy of the process and the environmental balance of the process in comparison to the production of virgin raw-materials. Microwave reactors seem to be a way how to overcome the problem of high energy demanding recycling processes. The origin of the microwave heating lies in the ability of the electric field to polarize the charges in the material and the inability of this polarization to follow extremely rapid reversals of the electric field<sup>1</sup>.

Recently we have developed recycling processes for several kinds of waste plastics (PUR, PET and PC), which utilize a microwave (dielectric) heating and significantly reduce operating costs of the whole process. These processes always consist of three main steps: i) mechanical pre-treatment of plastic waste to a form suitable for feeding to a reactor, ii) chemical decomposition in the microwave-heated reactor and iii) purification of a recycled polyol product obtained.

The basic physico-chemical properties of polyol products obtained by chemolysis of various plastic wastes (PUR, PET and PC) as well as their further applications are given in Table 1. The application possibilities for the polyols depend on the type (structure) of original polyol but can be also adjusted by suitable selection of a decomposing reagent.

1. Metaxas, A.C., Meredith, R.J. Industrial Microwave Heating. London: Peter Peregrinus, 1983. p. 357.

**Table 1** Properties of prepared recycled polyol products

<i>Source of plastic waste</i>	<i>Appearance</i>	<i>Viscosity, 25 °C [mPa.s]</i>	<i>Hydroxyl number [mgKOH.g<sup>-1</sup>]</i>	<i>Water content [wt.%]</i>	<i>Application</i>
PUR	Brown liquid	2 400	430	0.3	Rigid PUR foam
PUR	Yellow liquid	1 100	133	< 0.1	Flexible PUR casts, Aerosol PUR foam
PET	Yellow liquid	1 300	100	< 0.1	Flexible PUR casts
PC	Yellow liquid	3 700	350	< 0.1	Rigid PUR foam