

**INVESTIGATION OF THE MOLECULAR WEIGHT AND MOLECULAR WEIGHT DISTRIBUTION OF POLYPROPYLENE MACROMONOMERS BY SIZE-EXCLUSION LIQUID CHROMATOGRAPHY**

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By varying the degradation temperature and pressure, the average molecular weight (MW) of polypropylene macromonomers (PPMM) was regulated. The obtained liquid product was subjected to repeated vacuum distillation, resulting in a narrow fraction of polypropylene macromonomer. The molecular weight (MW) and molecular weight distribution (MWD) parameters of the synthesized PPMM and its copolymers were determined by size-exclusion liquid chromatography (SELC) using a high-performance liquid chromatograph manufactured by Kovo (Czech Republic) equipped with a refractive index detector. Two columns (3.3 × 150 mm) packed with Separon-SGX stationary phase (particle size 7 μm, pore size 100 Å) were used. Dimethylformamide served as the eluent at a flow rate of 0.3 mL/min and a temperature of 20–25°C. The calibration dependence of logM versus VR in the molecular weight range M = (1.5–100) × 10<sup>2</sup> was obtained using polyethylene glycol standards and is described by the equation:

$$VR = C_1 - C_2 \log M; \text{ where } C_1 = 24.4 \text{ and } C_2 = 4$$

MWD chromatograms were performed according to the method in which calculations were made using the following equations:

$$M_w = \sum M_i \omega_i; M_n = 1 / \omega_i / \sum M_i$$

where  $M_i$  is the molecular weight corresponding to the  $i$ -th chromatographic peak area, and  $\omega_i$  is the fractional area of the respective peak.

The molecular weight values and molecular weight distribution parameters of the synthesized polypropylene macromonomers (PPMM) were determined by size-exclusion liquid chromatography (Table 1). It was found that, depending on the thermodestruction conditions, PPMM can be obtained over a wide range of molecular weights. For example, a macromonomer produced under relatively mild conditions ( $T = 340^\circ\text{C}$ ,  $P = 500 \text{ mmHg}$ ), which is a low-viscosity liquid, as expected, exhibits low average molecular weight values ( $M_w = 754$ ,  $M_n = 650$ ) and a narrow molecular weight distribution ( $M_w/M_n = 1.16$ ).

Table 1. Influence of the conditions of thermal destruction on yield, molecular-weight and functional characteristics of macromonomers based on PP

№	$T, ^\circ\text{C}$	Pressure, Mm merc.c.	Yield, %	$M_n$	$M_w$	$M_w/M_n$	$M_{eqv}$	C=C, %	$f_n^*$
1	320	400	93.6	820	894	1.09	820	3.17	1.00
2	320	500	94.0	780	858	1.10	710	3.66	1.10
3	340	400	93.6	700	798	1.14	637	4.08	1.10
4	340	500	94.6	650	754	1.16	540	4.80	1.20
5	340	600	93.6	580	650	1.12	445	5.83	1.30
6	360	400	92.3	545	627	1.15	420	6.20	1.30
7	360	500	90.0	500	600	1.20	400	6.50	1.25
8	360	600	88.9	450	540	1.20	343	7.57	1.31

$f_n^*$  = average-numbered functionality on C=C bonds.