POLYMERIZATION OF ETHYLENE AND VINYLMELAMINES WITH ZIEGLER-NATTA-CATALYST

Manuela List,[1,*] Martin Irrgeher,[1] Clemens Schwarzinger,[1]

[1]Institute for Chemical Technology of Organic Materials, Johannes Kepler University Linz, Austria

ABSTRACT

Polyethylene is the most widely used plastic in the world. The properties of polyethylene are further controlled and modified by copolymerization with higher α-olefines. The most important are butane (C4), hexane (C6), and octane (C8). Ethylene can also be copolymerized with a wide range of non olefinic monomers. Common examples are ethylene-vinyl-acetate copolymer (EVA) and different ethylene-acrylate copolymers.

The principle to increase the flame resistance of polyolefine's is to polymerize ethylene and then mix it physically with a nitrogen compound. Common flame retardants are melamine, melamine-cyanurate [1], trihydrazinotriazine, triguandinotriazine or the phosphoric or boric acid salts [2] of the latter two. Flame retardants are homogenized with the polyolefine and than extruded at 200 °C. The disadvantage of this method in case of melamine is that melamine partly migrates to the surface during the process. Melamine cyanurate tends to sublime during the incorporation into a polymer, which means the polymer foams and the bulk density is reduced.

To avoid the aforementioned problems we have tried to incorporate a melamine based flame retardant via copolymerization, thus affording a chemically homogeneous system. This work gives a short overview about the first laboratory experiments on polymerizing ethylene and vinylmelamines with a Ziegler-Natta type catalyst. Titanium tetrachloride and diisobutylaluminumhydride were used as catalyst and the reaction was carried out in heptane as solvent. Reaction temperature, time, and catalyst ratio were varied. The characterization of the solid products was carried out with elemental analysis (CHN), differential scanning calorimetry, pyrolysis-GC/MS, and molar mass was determined by viscosimetry.

References:

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