# NEW HYBRID HALOGEN FREE FLAME RETARDANT

Dorota Kijowska[a], Piotr Jankowski[a]
[a)]*Industrial Chemistry Research Institute, Rydygiera st., 8, 01-793 Warsaw, Poland*
*(dorota.kijowska@ichp.pl, www.ichp.pl)*

Compounds containing chlorine or bromine atoms in the structure have ben used as flame retardants for many decades. However, polymers which are modified by that kind of flame retardants emit toxic gases during the combustion. These gases are more hazardous to health than the fire itself. In recent years particular attention was paid to melamine or its derivatives, especially the salts of melamine as flame retardants. One of the halogen-free flame retardant is melamine phosphate (FM). It is prepared by reacting melamine with phosphoric acid. The aim of this work was the developing of the methods of the modification of silicate layer-tabular mineral (SL-TM) using salts of melamine, i.e. melamine phosphate or melamine polyphosphate (PFM). The modified mineral was used as flame retardant to thermoplastic polymers.

The main objective of this work were researches concerning of the methods of the modification of silicate layer-tabular mineral using the salts of melamine, i.e. melamine phosphate or melamine polyphosphate.

Modification was confirmed using IR spectroscopy and thermogravimetric analysis. Also, the scanning electron microscopy of the modified salts was made.

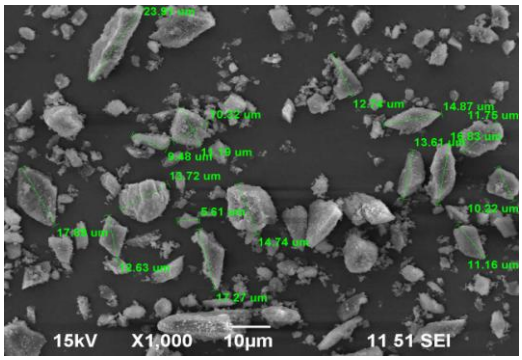


Fig.1 SEM of FM modified by 40 % by weight of SL-TM

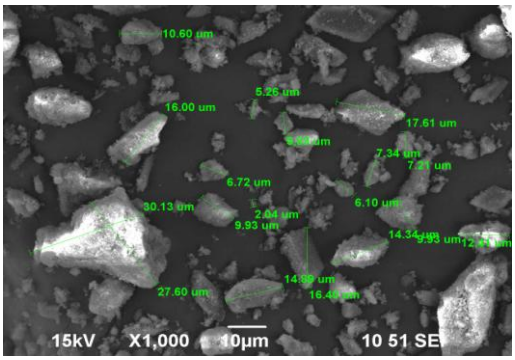


Fig. 2 SEM of PFM modified by 40 % by weight of SL-TM

The obtained salts of melamine were introduced, in the amount of 10 and 15 percent by weight, into the selected thermoplastic polymers, i.e. polyethylene (PE), polypropylene (PP) and polyamide 6 (PA6) using twin

screw extruder. Than the test samples were made and oxygen index was limited and mechanical properties were examined.

In the case of polyethylene and polypropylene the value of the oxygen index increased. But in case of polyamide 6 values remains unchanged. The thermogravimetric analysis of the modified polymers was made. In the case of PP the influence of the flame retardant on the thermoresistance of the sample is observed. It is visible that at the same temperature the loss of the mass of the sample with a filler is smaller than the control sample. So, the same loss of the mass of the filled sample is reached at a higher temperature than the sample without the filler

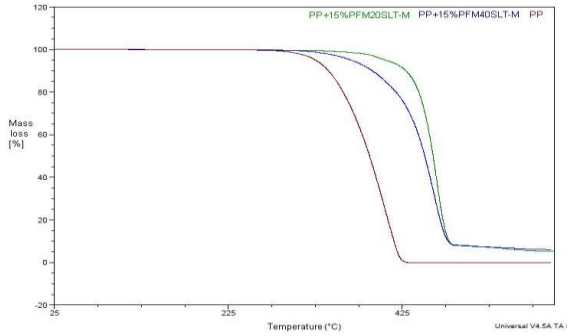


Fig. 3 Comparison of TG curves of pure PP and PP filled by melamine polyphosphate modified by 20 and 40 % by weight SL-TM.

The modification of salts of melamine by silicate layer-tabular mineral had a positive effect on the mechanical properties of thermoplastic polymers which were filled with modified salts of melamine.

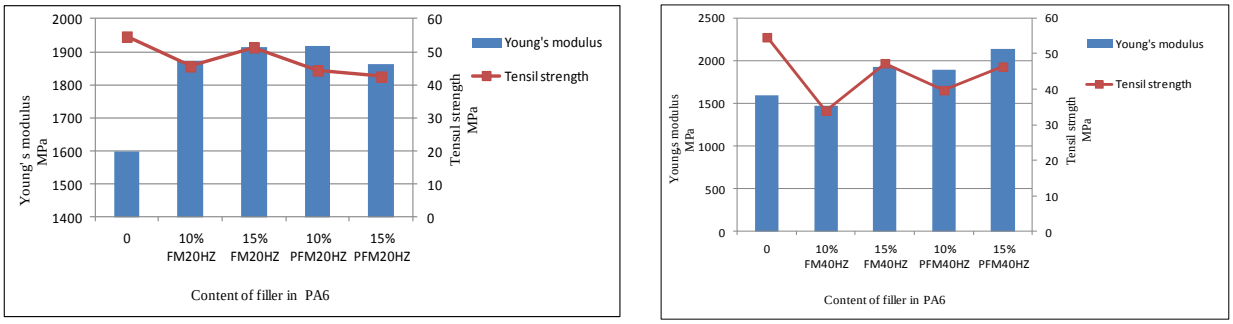


Fig. 4 Dependence of Young's modulus and tensile strength on quantity and kind of filler in PA 6.

As shown on the drawings the calcinations of melamine phosphate (modified by 20 percent by weight of SLT-M) to melamine polyphosphate and introducing it into the plastic caused increase of Young's modulus and the modulus of elasticity. On the other hand, tensile and bending strength remains unchanged or slightly decreased. So, rigid materials with unchanged strength and better thermal resistance are obtained.