Flammability and thermal stability of elastomeric composites containing aluminium or magnesium hydroxide and phthalocyanine derivatives

Agnieszka Pająk[1], Szymon Żaczek[1], Przemysław Rybiński[2], Grażyna Janowska[1]

[1]*Lodz University of Technology / Institute of Polymer and Dye Technology*
sz.zaczek@samorzad.p.lodz.pl
pajak.agnieszka@wp.pl
[2]*The Jan Kochanowski University, Kielce / Department of Environment Protection and Modelling,*

Flame retardants, such as magnesium or aluminium hydroxide, zinc borate and antimony trioxide are commonly used to limit the flammability of elastomeric materials. Elastomers commonly used in industry, eg. styrene-butadiene rubber (SBR) and acrylonitrile-butadiene rubber (NBR) are characterised as materials with high fire hazard and low resistance to high temperatures and fire. Addition of flame retardants to those elastomers usually combines with worsening mechanical properties of obtained, filled vulcanizates.
On the other hand, anyone could have barely imagined the world without colours. It has also a significant influence on an industry – engineers tend to impart pigments or dyes wherever it is possible to enhance visual effects of materials they are producing.
It was proven that there are pigments, which apart from implementing the desired colour, have a remarkable influence on thermal stability and limitation of flammability of elastomeric composites. Substances in question are phthalocyanine derivatives [1, 2].

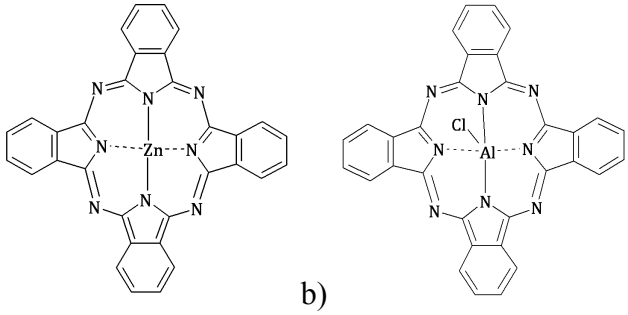

Figure 1. Pigments applied to elastomeric rubbers: a) zinc phthalocyanine, b) chloroaluminium phthalocyanine [1]

This paper presents the influence that zinc and chloroaluminium phthalocyanine has on thermal stability and flammability of elastomeric composites containing magnesium or aluminium hydroxide used as a typical flame retardant. Investigations such as oxygen index, flammability test in air and mechanical properties proved that the addition of phthalocyanine derivatives to rubber mixture (SBR or NBR) filled with $Mg(OH)_2$ or $Al(OH)_3$ improves its thermal stability and limits flammability. Apart from that, pigment imparts a blue colour to elastomeric composites, which results in better utility and esthetical properties of final products.

[1] Pająk A., Rybiński P., Janowska G., Kucharska-Jastrząbek A., *The thermal properties and the flammability of pigmented elastomeric materials. Part I. Phthalocyanine pigments*, Journal of Thermal Analysis and Calorimetry (2014); on-line: DOI 10.1007/s10973-014-3739-x
[2] Czajkowski W., Janowska G., Pająk A., Kowalczyk M., Polish Patent PL 216579