# IN-MOULD MULTIFUNCTIONAL COATINGS WITH GRAPHENE NANOCOMPOSITES

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Two-dimensional, single layers of graphite, called graphene, have been studied for over 40 years now, due to its impressive properties such as high electrical conductivity, high thermal stability and mechanical strength [1, 2]. Additionally these two dimensional graphene sheets act as barrier and reduce gas permeability [3]. Thus applications of graphene in coatings where its geometry can be best utilized are most suitable. The aim of the work was the straightforward production of composites for industrial coating purposes with focus to enhance the electrical conductivity and increase mechanical and barrier properties of coating polymers. Therefore, composites of a high performance thermoplastic and graphene in different concentrations were produced by film extrusion. These composites were further treated to produce films with a homogeneous graphene distribution. The differences of in-bulk conductivity after extrusion and conductivity in films with aligned graphene sheets were evaluated by 2-point probe and 4-point probe electrical conductivity measurements. The mechanical properties were additionally evaluated via tensile tests. Permeability tests showed differences in water vapor transition and oxygen permeability upon the addition of varied graphene contents.

[1] Zhu, Y.; Murali, S.; Cai, W.; Li, X.; Suk, J. W.; Potts, J. R.; Ruoff, R. S. "Graphene and Graphene Oxide: Synthesis, Properties, and Applications"; Advanced Materials 2010, 22 (35), 3906-3924.

[2] Noorunnisa Khanam, P.; AlMaadeed, M. A.; Ouederni, M.; Harkin-Jones, E.; Mayoral, B.; Hamilton, A.; Sun, D. "Melt processing and properties of linear low density polyethylene-graphene nanoplatelet composites"; Vacuum 2016, 130, 63-71.

[3] Kim, H.; Miura, Y.; Macosko, C. W. "Graphene/Polyurethane Nanocomposites for Improved Gas Barrier and Electrical Conductivity"; Chemistry of Materials 2010, 22 (11), 3441-3450.