Structural and electrical properties of nanocomposites based on the EVA copolymer filled with nano-structuralized graphite

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Polymer nanocomposites prepared from high aspect ratio layered graphite nanofillers achieve significant improvements in mechanical, thermal, electrical and barrier properties at very low filler concentrations, compared to conventional composites, without a significant increase in density. This is caused by the sheet-like structure of natural graphite where the atoms are strongly bonded on a hexagonal plane but weakly bonded normal to that plane. If these graphene layers could be separated down to a nanometer thickness through intercalation and exfoliation, they would form graphite nanosheets, which possess a huge surface area and satisfy the high aspect ratio (200-1500) criterion needed for high strength composites.

Structural and electrical properties of nanocomposites based on the ethylene-vinylacetate (EVA) matrix filled with graphite micro and nanofiller will be discussed in this contribution. It was found that electrical conductivity of composites strongly depends on the graphite structure. The polymer structure was investigated by transmission electron microscopy. In the case of micro-sized graphite, the percolation concentration of the filler is at about 15-17 vol.%, whereas when nano-sized the percolation concentration in composites was significantly lower – its value was at about 5-6 vol.%. Electrical conductivity of graphite-based nanocomposites was found to be much higher than electrical conductivity of graphite based microcomposites at comparable concentrations.