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Processing Electrically Conductive Compounds Containing Low-Melting Metals

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More and more plastics components have to fulfil increasing demands on their electrical and thermal conductivity, e.g. elements of the engine and transmission management systems or moulded interconnect devices. Here, commonly used polymer materials are reaching their property and processing limits. Today, to improve the part properties thermoplastics are mixed with conventional non-polymer additives (e.g. metal fibres, carbon black). Compounds with a high content of solid fillers are difficult to process (e.g. due to a substantial viscosity increase) and cause extensive wear on the surfaces of the machinery.

To avoid these problems a new material has been developed at IKV in cooperation with Siemens AG. The solid fillers have been partially replaced by metal alloys with a low melting point (200 °C), which melt during processing. As presented in this paper, these alternative polymer/metal blends reveal excellent electrical properties by forming a highly conductive network throughout the component part without increasing the melt viscosity relevantly.

The resulting compound is a free-flowing, ready to process material that allows the injection moulding of complex geometries. Its electrical conductivity is several magnitudes higher than that of pure PA 6 and even higher than the conductivity of thermoplastics filled exclusively with metal fibres.

In addition to the electrical properties the morphology and mechanical properties of differently shaped test parts have been examined and will be discussed in this paper in detail. Different metal alloys as well as the influence of process parameters will be taken into consideration.