**Advanced thermoplastics for the next generation power cables**

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High-voltage direct current (HVDC) cables are a critical component of tomorrow’s power grids that seamlessly integrate renewable sources of energy. For the polymeric insulation layers, mechanical stability together with increased electrical insulation and good thermal management are of highest importance. The addition of high aspect ratio fillers or minor amounts of a secondary polymeric phase, offers novel design opportunities. Their dispersion adds at the same time an additional level of complexity, in particular through the interaction between filler, matrix and the polymer’s amorphous and crystalline phases. Therefore, good knowledge of the thermoelectrical and morphological behaviour is key for the understanding of the long-range material performance. The optimization of the filler design and the matrix setup can be used for reducing the required loading thresholds and improving effectiveness.