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HALOGEN-FREE FLAME RETARDED POLYPROPYLENE COMPOSITES BY ELECTRON INDUCED REACTIVE PROCESSING

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To gain sufficient fire properties of polyolefines they require usually the incorporation of high amounts of halogen-free flame retardants (> 60 wt% of magnesiumhydroxide in polypropylene). Due to the incompatibility between the mineral hydrophilic filler and hydrophobic polymer matrix the processability and mechanical performance of such flame retarded compounds are deteriorated. To reduce these drawbacks the interaction at the interface between particulate filler and polymer matrix has to be improved. A free-radical induced reactive melt-mixing process with in-situ compatibilisation of flame retardant filler and matrix polymer improves the phase interaction. During this reactive melt-mixing in an internal mixer radically induced chemical reactions and mixing processes are overlapped. The formulation consists of five componentes and includes (beside the polypropylene matrix and magnesiumhydroxide as flame retardant filler) a combination of a thermically activatable radical initiator, an allylic phase coupling agent and a maleic anhydride based compatibiliser. Starting from this established formulation it was investigated, whether: (1) a tailored reactive electron threatment during melt-mixing, can substitute the radical initiator as well as the compatibiliser, and (2) if the resulting compounds exhibit a comparable combination of properties (flammability, rheological and mechanical). It has been found that accelerated electrons can induce similar reactions during reactive melt-mixing leading to flame retarded compounds with comparable or even better physical performance, especially when addressing toughness and impact properties, while maintaining the required level of flame retardancy. This means that electron induced reactive processing can replace the use of radical initiators such as peroxides as well as compatibilisers for improving the phase interactions in incompatible polymer compounds.