Compounding and processing studies of short aramid fibre filled polymer compounds

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There is a renewed interest in the application of short-cut aramid fibres in elastomers due to the considerable improvement of tribological properties of the corresponding rubber composites. In particular cut, chipping and chunking resistance in truck tires can be enhanced, as reported by Datta et al.*. In addition, the hysteretic properties of aramid-fibre reinforced rubber are greatly reduced, which lowers the rolling resistance of the corresponding tires and, therefore, saves fuel and prolongs their durability. Further possible applications of short-cut aramid fibre reinforced compounds are dynamically loaded rubber seals, diaphragms, engine mounts, rubber layers on counter-rotating rollers and rotating cylinders, transmission belts, conveyer belts, and hoses. In the past, the use of short aramid fibres was hampered by the chemical inertness of the aramid surface, leading to a lack of interaction between fibre and elastomer, resulting in dispersion problems and insufficient fibre-matrix adhesion. The recent progress of Teijin Aramid in the development of surface modified aramid fibres might overcome these problems. Our studies are related to the investigation of controlled fibre orientation that is induced during processing, including its experimental characterization and the theoretical description of fibre orientation patterns. Further objectives include the investigation of technological and material related parameters on fibre dispersion/distribution after compounding. We show how combined studies using optical microscopy, scanning electron microscopy, confocal scanning laser microscopy, dynamic mechanical analysis and tensile testing are necessary to explore the new generation short-cut aramid fibre reinforced polymer composites. We gratefully acknowledge the financial support of the Dutch Polymer Institute, Teijin Aramid BV. for providing Twaron shortcut fibres and DSM NV. for providing of masterbatches und chemicals.