Influence of moisture absorption on properties of fiber reinforced polyamide 6 composites

A state-of-the-art study of thermoplastic polymer matrix materials for fiber composites has identified polyamide 6 (PA6) as a potential candidate thermoplastic polymer relevant for manufacturing large composite structures like wind turbine blades. The mechanical properties of PA6 are highly sensitive to moisture, and if PA6 is used as matrix material in a fiber composite, the properties of the fiber composite will depend on the moisture content of the material. At standard condition (23 °C and 50% RH) polyamide6 absorbs about 3 weight-% of water, whereas the PA6 material is dry right after manufacturing of components. In the current article, lamina properties of dry glass fiber/PA6 and conditioned (23 °C, 50% RH) glass fiber/PA6 are calculated for lamina with two different fiber content (45 and 50 vol-%) by the use of classical micro mechanics. The matrix dominated properties like the shear stiffness, the shear strength and the stiffness and strength across the fiber direction are the ones which are mostly affected by the moisture content in the material.