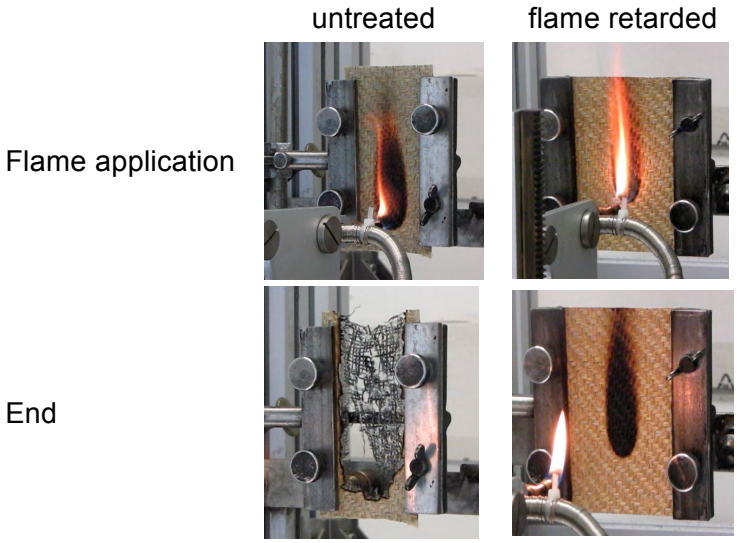
Boron-based Flame Retardant Finishing with Smoke Suppressing Capability for Natural Fibre Reinforced Composites

Besides a good fire persistence for many fire protection applications, especially in the building and mobility sector, a reduced smoke production is a critical demand. Boric acid and its salts have proven to be effective in this manner by forming a protective glassy surface upon flame exposure as well as charring organic compounds, binding carbon in the condensed phase and thus suppressing the flames fuel supply. Though boron is considered a micronutrient, very high doses of boric acid have shown to be toxic to reproduction in animal testing, entailing a classification under REACH. However, utilizing organoboron (B-C) or boron-nitrogen (B-N) compounds, covalently bound to the substrate, the risk of an exposure of boron-containing species can be minimized, making them safe to use as flame retardants. Furthermore, the developed finishings will offer an efficient alternative to the established, but toxic and environmentally concerning halogenated flame retardants.

In this research project, B-C and B-N flame retardants will be developed for the permanent finishing of natural fibre-based textiles, such as cotton, flax, and regenerated cellulose fibres. The finished textiles are processed into natural fibre reinforced composites by embedding them into a polymer matrix. Produced composites are analysed regarding their flammability and mechanical properties, where special attention is paid towards the fibre-matrix adhesion, which ideally will be enhanced by the finishing.



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