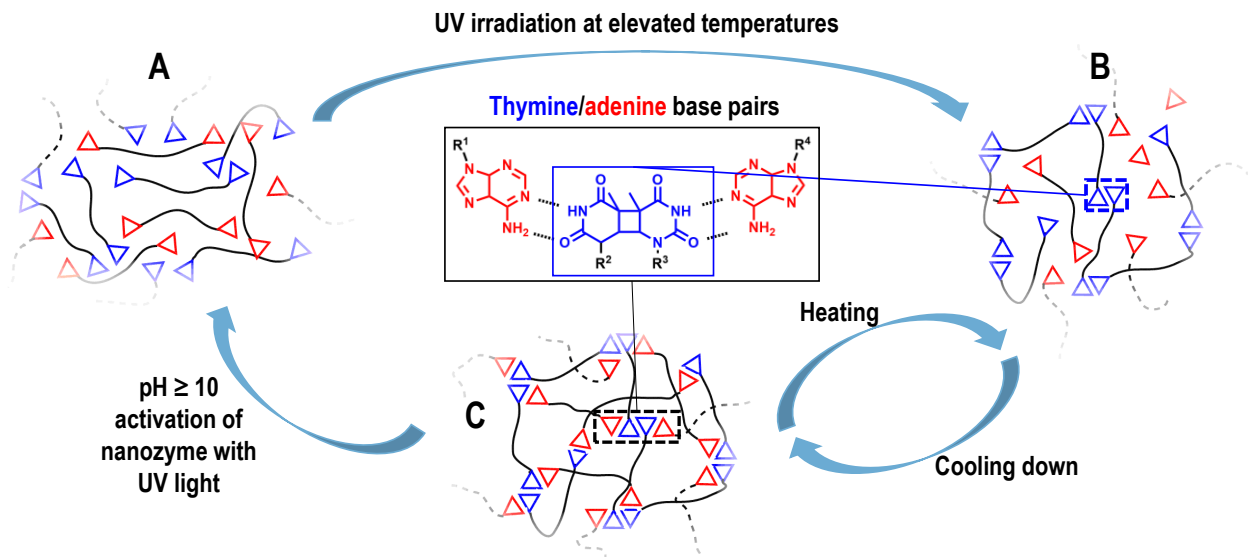


Bioinspired polyurethane coatings and their application on resilient floor coverings (IGF 01F22785N)

As part of the Green Deal, the European Commission presented the EU Action Plan for Pollution-Free Air, Water, and Soil. Among other things, this action plan sets out milestones for reducing pollution at source by 2030. These targets include a significant reduction in the amount of plastic waste, especially microplastics, entering the environment. Against this backdrop, the EU Regulation on the eco-design of sustainable products came into force in July 2024.

With the aim of reliably preventing microplastic emissions, novel PU coatings based on biodegradable PU oligomers have been developed that form reversible networks via bio-inspired cross-linking groups (thymine or adenine groups). Both thermally switchable bonds (adenine/thymine pairs) and bonds that can be cleaved by artificial enzymes (nanozymes) (thymine dimers) are formed in the film. The network of the bioinspired PU coating is formed by UV irradiation after application of the heated oligomers (mixture) and subsequent cooling. Due to the thermally switchable 3-dimensional cross-linking of the coating, minor mechanical damage can be compensated by local heating (transfer to the liquid state). After major material removal, the coating can also be easily regenerated by incorporating a newly applied layer into the network structure of the old coating still present on the floor, thereby maintaining a homogeneous network. If soil migrates into the PU coating, the old coating can be easily removed before applying the new one. To do this, the nanozyme is applied to the coating as an alkaline dispersion, which is activated by exposure to VIS light (e.g. ceiling lighting) and breaks down the reversible covalent cross-linking points in the bioinspired PU coating. For this, the old coating is specifically destabilized by breaking the enzymatically cleavable bonds using nanozymes under UV irradiation. The coating can then be easily removed from the floor covering in the form of biodegradable PU oligomers by treatment with hot water (breaking the thermally switchable bonds).

The research report is available on request from the wfk - Cleaning Technology Institute.



Bioinspired PU coating during application/detachment (A), after UV-induced formation of thymine dimers (B) and after formation of thymine/adenine base pairs (C)