

UV-curable bio-coating - kinetic analysis

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Development of a sustainable, 99% bio-based epoxy material for coating applications and kinetic analysis thereof

Epoxidized 100% bio-based linseed oil was cured by UV-irradiation and complementary thermal “post-baking” using 1wt-% of a non-toxic photo acid generator. The developed procedure allowed for avoidance of any solvents or accelerators. By this means a homogeneous, transparent and flexible material with evidently elastomeric character ($T_g \sim 0^\circ\text{C}$, dependent on post-hardening temperature) was produced.

Since curing kinetics is most relevant for optimization of curing parameters and adjusting final material characteristics, kinetic analysis was performed. For this purpose, temperature-guided Infrared spectroscopy was performed to track the reaction process. Hence, by evaluation of the height changes of selected absorption bands (such as oxirane stretching bands) in the course of time at various isothermal temperatures, kinetic parameters such as activation energy, kinetic model and rate constant could be determined.

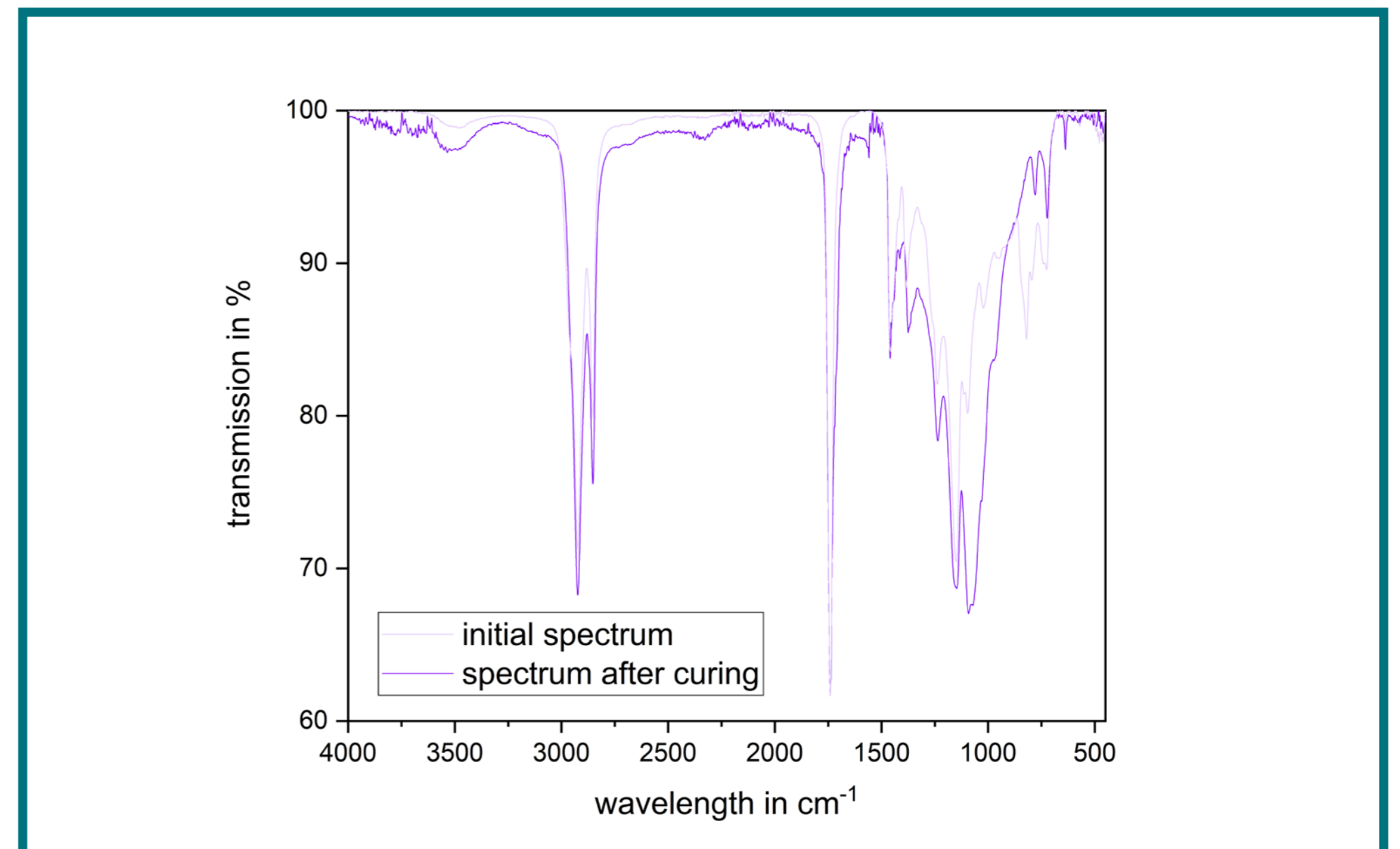


Fig. 1: Comparison of initial transmission spectrum (mauve) and spectrum after curing (dark violet; here after 24h of curing at 70°C).

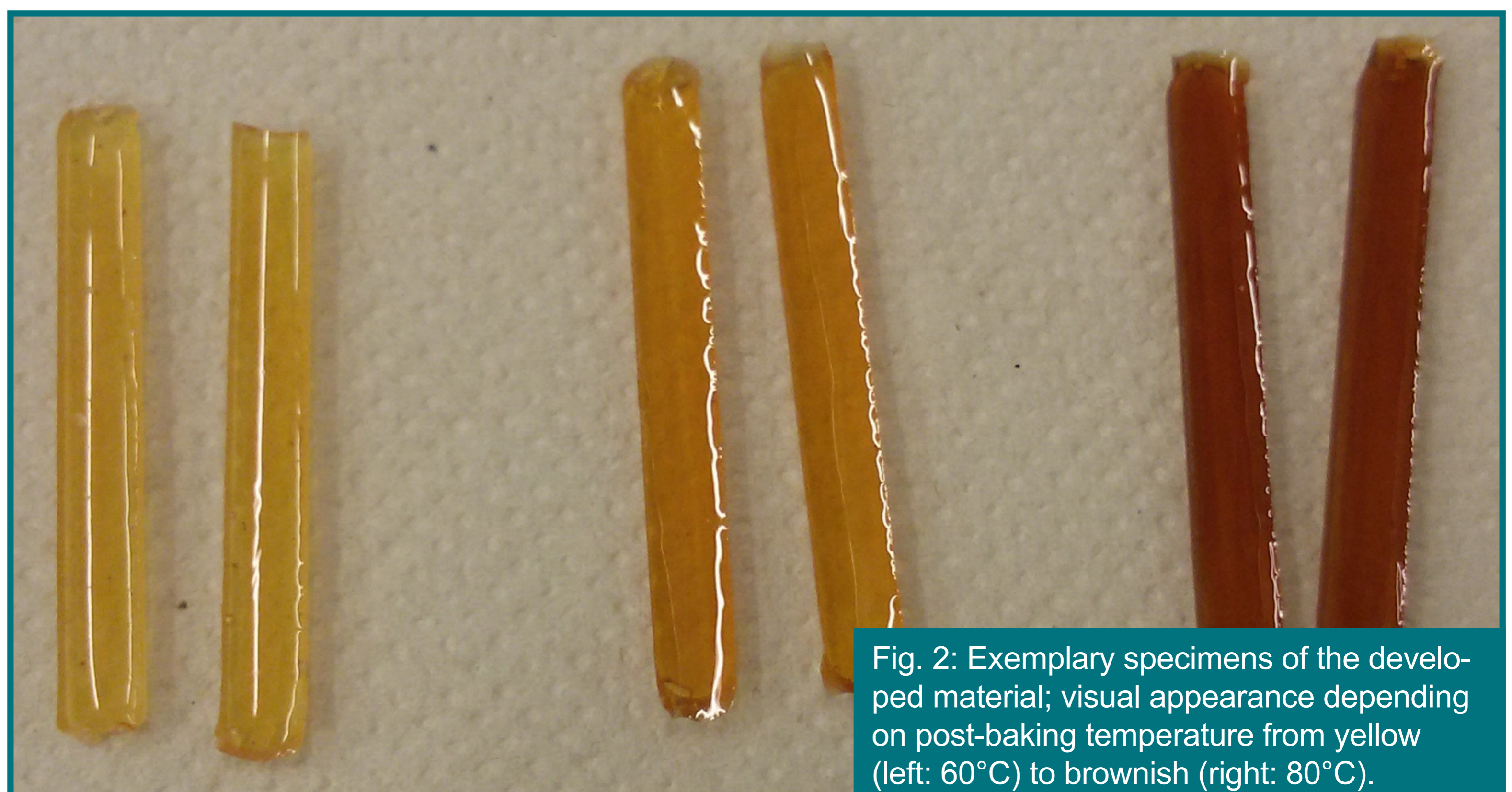


Fig. 2: Exemplary specimens of the developed material; visual appearance depending on post-baking temperature from yellow (left: 60°C) to brownish (right: 80°C).



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RESEARCH FOCUS: Polymers based on renewable resources

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