NOVEL LIGHT-RESPONSIVE BIO-BASED FOAMS IMPREGNATED WITH PHOTOREVERSIBLE PRECURSORS THROUGH PHOTO-INDUCED POLYMERIZATION FOR ON-DEMAND RESHAPING CAPABILITY

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This study presents the development of novel light-responsive bio-based foams with controllable compliance and shape, achieved with the utilization of photoreversible precursors. Effective incorporation of the photoreactive precursors into the open-cell foam is reached through the implementation of a liquid impregnation process [1]. The optical properties of the impregnated foam are modelled using scattering theory. The controlled crosslinking relies on the reversible nature of [4πs + 4πs] or [2πs + 2πs] cycloaddition reactions [2], creating an interpenetrating phase composite [3]. The research places a particular emphasis on the analysis of the photoreversibility degree exhibited by the cured composite foam. The cleavage of the photodimers is triggered by short wavelengths UV irradiation or by thermally induced bond scission. This property serves as a pivotal parameter for fine-tuning foam compliance through controlled partial depolymerization, subsequently followed by repolymerization. Moreover, a comprehensive life-cycle costing and assessment is undertaken to evaluate the economic feasibility and sustainability of implementing these advanced materials in practical applications.

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