Eco-Adhesives: Transforming Waste Polystyrene Into High-Performance Glues Using Natural Solvents and Emulsifiers

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This study explores an eco-friendly solution to the environmental problem of polystyrene waste by converting expanded polystyrene (EPS) into functional adhesives using natural solvents and emulsifiers. Six adhesive formulations were developed by varying combinations of D-limonene, acetone, and lecithin. The adhesives were evaluated based on tensile strength, drying time, and volume reduction. The formulation containing D-limonene, acetone, and lecithin showed the best performance, achieving a drying time of 25 minutes and tensile strength of 350,000 Pascals— comparable to commercial glue. These results demonstrate the potential of waste EPS to be repurposed into sustainable, high-performance adhesives. This research lays the groundwork for further developing biodegradable and scalable adhesive alternatives through green chemistry.

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