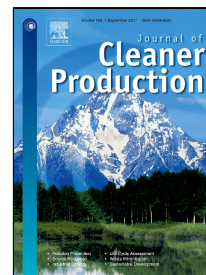


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Evaluation of environmental impacts of citric acid and glycerol outdoor softwood treatment: case-study



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12

13 **Abstract**

14 Over the last few decades, wood modification has been performed to improve wood product technical
15 performance. Using renewable based chemicals for wood modification is an innovative alternative to the non-
16 renewable petrochemicals commonly used. However, it should be kept in mind that having the raw material
17 from renewable sources does not guarantee zero environmental impacts. In this study, the treatment considered
18 uses citric acid and glycerol mixture; two chemical products derived from renewable sources. In the residential
19 building context of Quebec-Canada, the cradle-to-grave life cycle assessment for untreated and treated
20 lodgepole pine wood siding was performed and compared. The results obtained show that the treated wood
21 siding has higher environmental impacts than the untreated wood siding, in spite of its longer service life. This
22 is partially caused by the high contribution of citric acid production used for treatment. The current service life
23 expectancy of treated wood siding was estimated to be 2.8 times longer than the one of untreated wood siding
24 based on standardized durability test and classification (AWPA E 10-12 and ASTM D 2017-05). Sensitivity
25 analysis showed that life cycle impacts of treated wood siding become lower than those from untreated wood
26 siding when service life expectancy reaches 5-times that of untreated wood siding. Life cycle assessment could
27 be used for guidance in developing better treatments to improve their environmental impacts.

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