## The production of levulinic acid and formic acid from red macroalga Kappaphycus alvarezii using methanesulfonic acid

Publons ID	(not set)
Wos ID	WOS:001205168900014
Doi	10.1016/j.biteb.2022.100954
Title	The production of levulinic acid and formic acid from red macroalga Kappaphycus alvarezii using methanesulfonic acid
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Publish Date	FEB 2022
Journal Name	BIORESOURCE TECHNOLOGY REPORTS
Citation	3
Abstract	Levulinic acid (LA) and formic acid (FA) are high-value chemicals that can be generated from biomass and are widely used in diverse industries. Kappaphycus alvarezii is potential biomass to be developed as raw material for producing LA and FA. Biomass, catalyst, and reaction factor play important roles in LA and FA production. In this research, we investigated the conversion of macroalgae K. alvarezii for the production of LA and FA through the thermochemical reaction with methanesulfonic acid (MSA) as an environmental-friendly and strong acidic catalyst under the response surface statistical approach. By optimizing the reaction factors, the highest LA and FA yield of 14.69% and 5.35%, respectively were attained under the conditions of 180 o C reaction temperature, 0.6 M MSA catalyst concentration, 30 min reaction time, and 2.5% biomass load. The application of K. alvarezii and green catalyst MSA in LA production can be a new insight into macroalgae biorefinery.
Publish Type	Journal
Publish Year	2022
Page Begin	(not set)
Page End	(not set)
lssn	2589-014X
Eissn	
Url	https://www.webofscience.com/wos/woscc/full-record/WOS:001205168900014
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