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# Choline chloride (ChCl) and monosodium glutamate (MSG)-based green solvents from optimized cactus malic acid for biomass delignification

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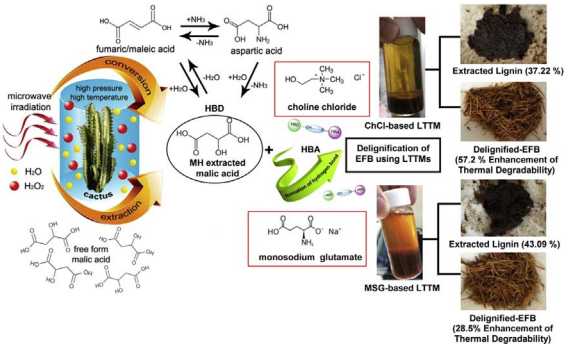
## GRAPHICAL ABSTRACT




## ARTICLE INFO

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## ABSTRACT

This work aimed to develop an efficient microwave-hydrothermal (MH) extraction of malic acid from abundant natural cactus as hydrogen bond donor (HBD) whereby the concentration was optimized using response surface methodology. The ideal process conditions were found to be at a solvent-to-feed ratio of 0.008, 120 °C and 20 min with 1.0 g of oxidant, $H_2O_2$. Next generation environment-friendly solvents, low transition temperature mixtures (LTTMs) were synthesized from cactus malic acid with choline chloride (ChCl) and monosodium glutamate (MSG) as hydrogen bond acceptors (HBAs). The hydrogen-bonding interactions between the starting materials were determined. The efficiency of the LTTMs in removing lignin from oil palm biomass residues, empty fruit bunch (EFB) was also evaluated. The removal of amorphous hemicellulose and lignin after the pretreatment process resulted in an enhanced digestibility and thermal degradability of biomass.

## 1. Introduction

The extreme utilization of fossil fuels and the corresponding environmental effects such as global warming and environmental pollutions have become global problems and urged people to aggressively search for cheap, environmental friendly and renewable energy.

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