**INTRODUCTION**

Sugarcane waste (i.e. bagasse) is an abundant and relatively low cost carbohydrate resource. Platform chemicals such as levulinic acid and furanics can be produced through acid-catalyzed dehydration and hydrolysis of carbohydrates.

Commercial production of levulinic acid and furfural suffers from the use of corrosive mineral acid catalysts such as sulfuric acid \((H_2SO_4)\) which increase equipment and operating costs and can lead to waste disposal issues associated with non-recovery of the catalyst [1,2]. Research is currently being undertaken with green acids and co-solvents such as glycols in an effort to improve the overall process of producing the compounds.

**EXPERIMENTAL**

- **Feed** - Glucose/xylose mixtures (equivalent in proportion to different types of lignocellulose) and sugarcane bagasse
- **Strong sulfonic acid catalysts** \((pK_a<1.8)\) of low corrosivity
- **Methanesulfonic (MSA), ethanesulfonic (ESA) and \(p\)-toluenesulfonic acid (TSA)
- **Ethylene glycol (EG) co-solvent** (high boiling point lignin solvent)
- **Operating conditions** \(160-200^\circ C\) (heat up time <2 min); 8-75 min; 0.1-0.8 M acid; 0-90% co-solvent; 1-7 wt% feed

**SUGARS – CATALYSTS**

- **H2SO4**
- **MSA**
- **ESA**
- **TSA**

**BAGASSE – EG CO-SOLVENT**

- **No co-solvent**
- **EG co-solvent (50%)**

**Fig. 2 – Levulinic acid yields from acid-catalyzed (MSA) reaction of bagasse at 180°C**

- **Harsh conditions** \(\uparrow\) yield of levulinic acid (Fig. 1 & 2)
- **Total levulinites** (lev acid + mono/di -esters) increased with co-solvent concentration and harsher reaction conditions
- **Carbon yield increased by up to \(\sim20\%\)**

**Fig. 3 – Furfural yields from acid-catalyzed (MSA) reaction of bagasse at 180°C**

- **Mild conditions** (& less reactants) \(\uparrow\) yield of furfural (Fig. 1 & 3)
- **EG improved yields of furfural produced under mild conditions**
- **Formic acid to levulinic acid ratio \(\sim1.2\) for bagasse (no co-solvent)**
- **Acetic acid (yields of 8-10 wt% for all conditions for bagasse)**

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REFERENCES