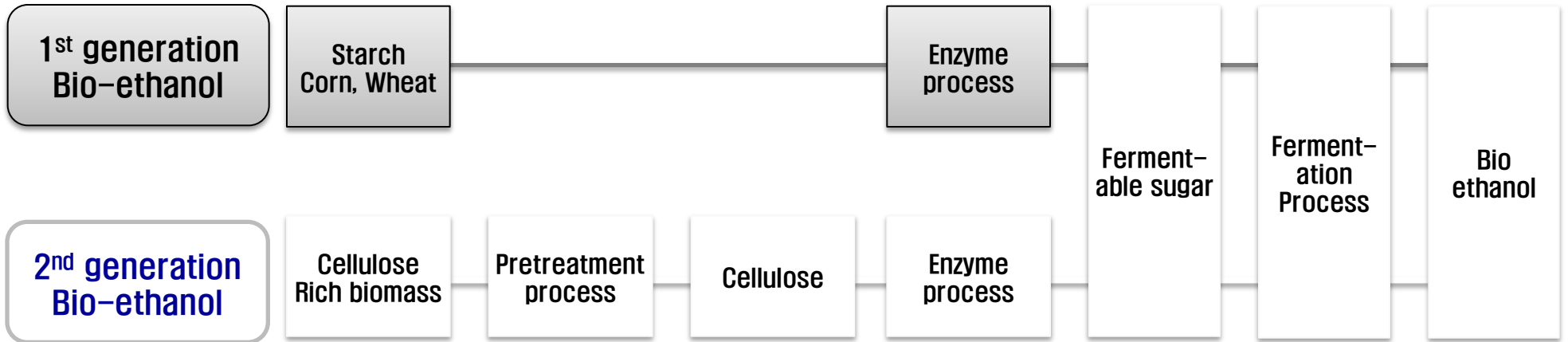


# Why Enzyme?

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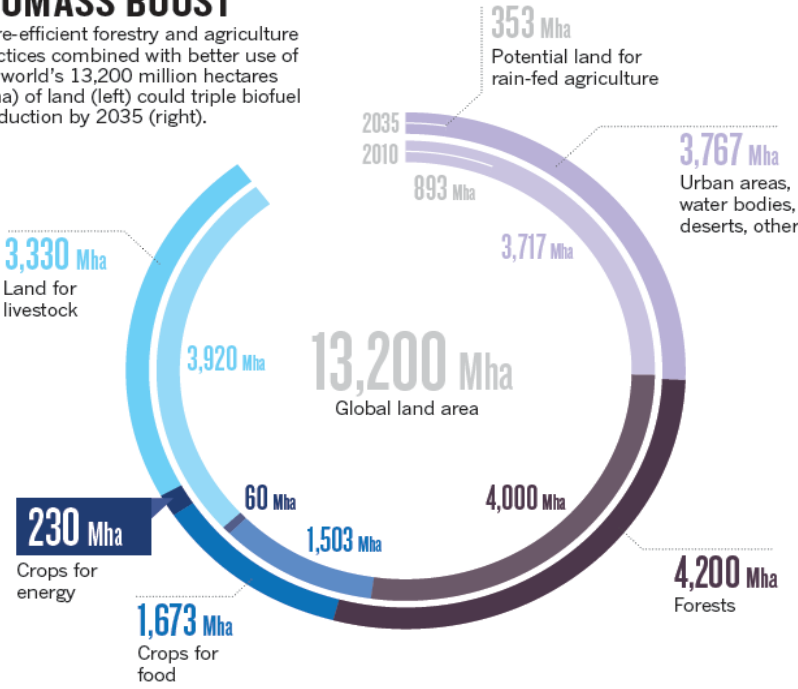
Insect Biotech

# Hemicellulosic Bioethanol

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## BIOMASS BOOST

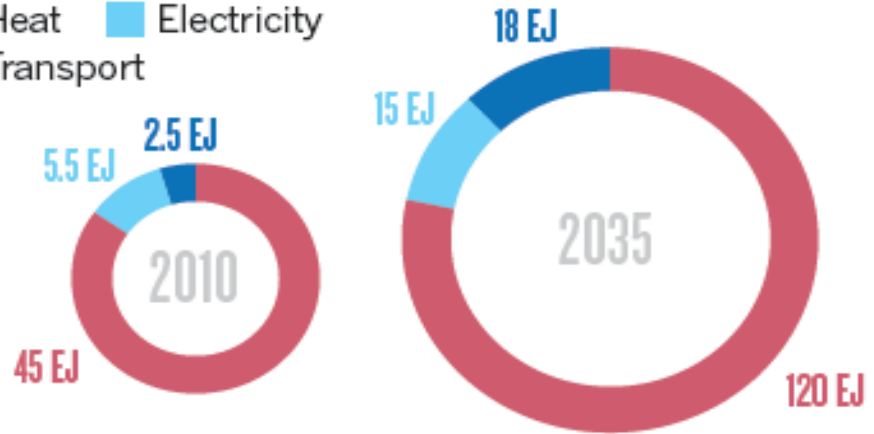
More-efficient forestry and agriculture practices combined with better use of the world's 13,200 million hectares (Mha) of land (left) could triple biofuel production by 2035 (right).



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## Uses of energy from biomass in exajoules (EJ)

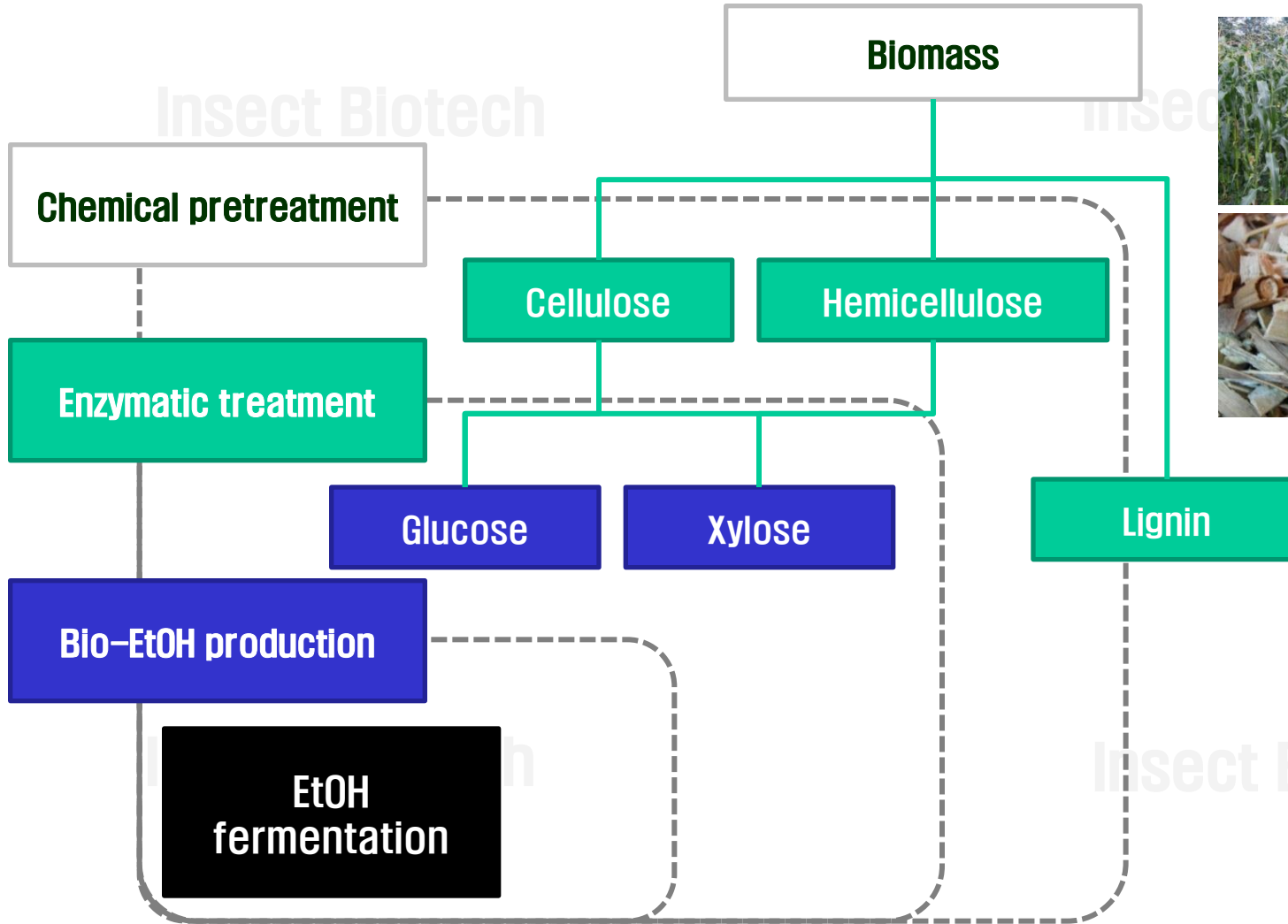
Heat Electricity Transport



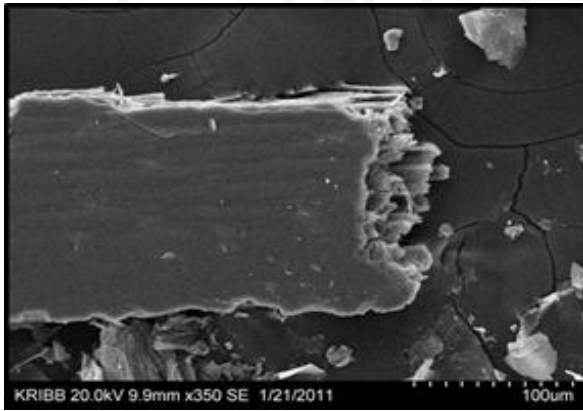
Insect Biotech

Heinz Kopetz, "Build a biomass energy market", Nature, 494, 2013, pp.29~31

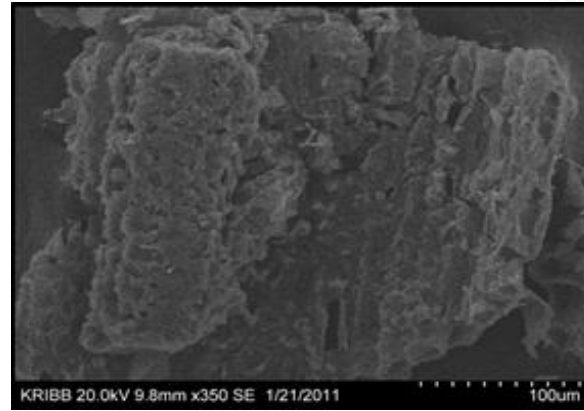
# Process of 2<sup>nd</sup> generation Bio-ethanol



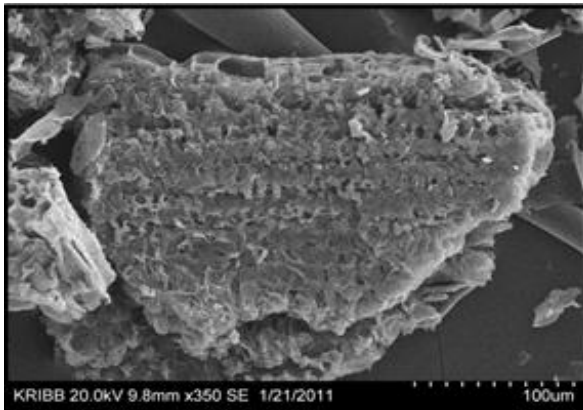
# HCl pretreatment



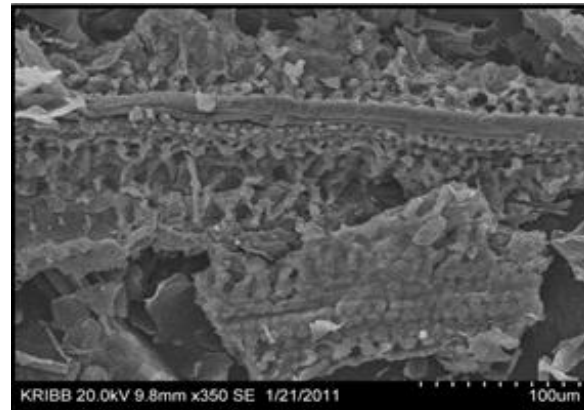
(A) Control



(B) 0.5% H<sub>2</sub>SO<sub>4</sub>



(C) 2% H<sub>2</sub>SO<sub>4</sub>

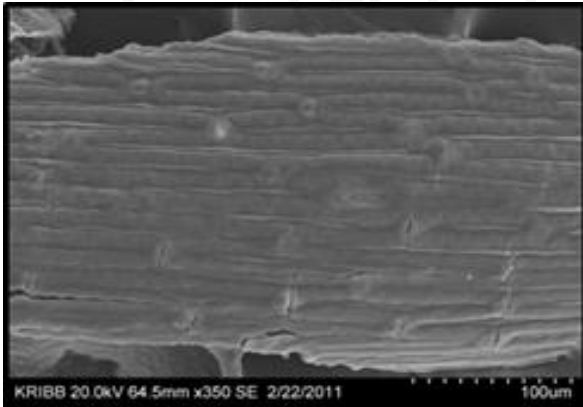


(D) 0.5% H<sub>2</sub>SO<sub>4</sub> + XylIT

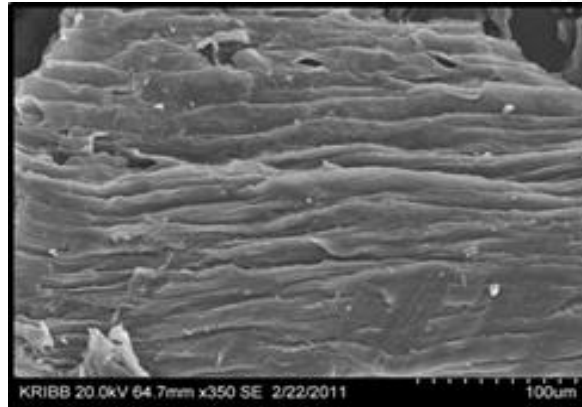
Fig. SEM images of native and pretreated corn stover samples:

- (A) Native corn stover sample (350X);
- (B) Corn stover sample pretreated with 0.5% H<sub>2</sub>SO<sub>4</sub> (350X)
- (C) Corn stover sample pretreated with 2% H<sub>2</sub>SO<sub>4</sub> (350X)
- (D) Corn stover sample pretreated with both 0.5% H<sub>2</sub>SO<sub>4</sub> and *IBT* xylanase (350X)

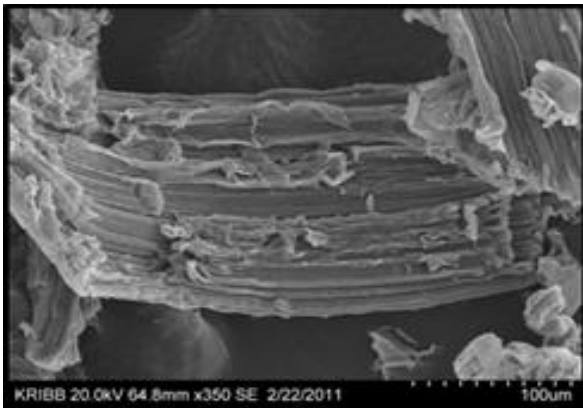
# NaOH pretreatment



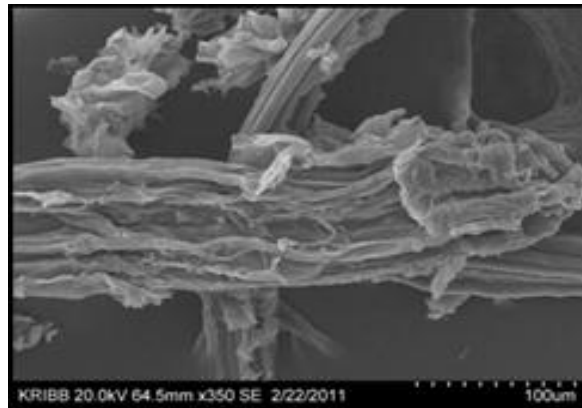
(A) Control



(B) XylIT



(C) 1% NaOH



(D) 1% NaOH + XylIT

Fig. SEM images of native and pretreated corn stover samples:

(A) Native corn stover sample (350X);

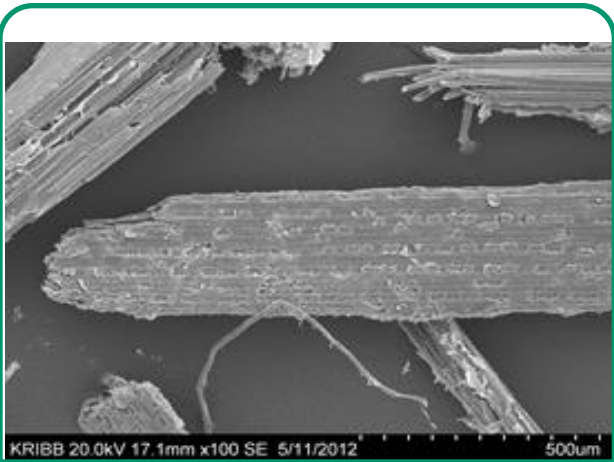
(B) Corn stover sample pretreated with *IBT* xylanase (350X)

(C) Corn stover sample pretreated with 1% NaOH (350X)

(D) Corn stover sample pretreated with both 1% NaOH and *IBT* xylanase (350X)



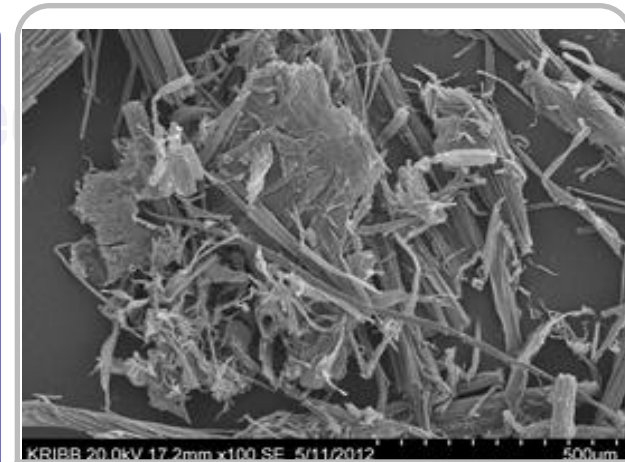
100X



Heating (90°C, 1h)



Pretreatment (1.5% NaOH 121°C, 30min)



250X

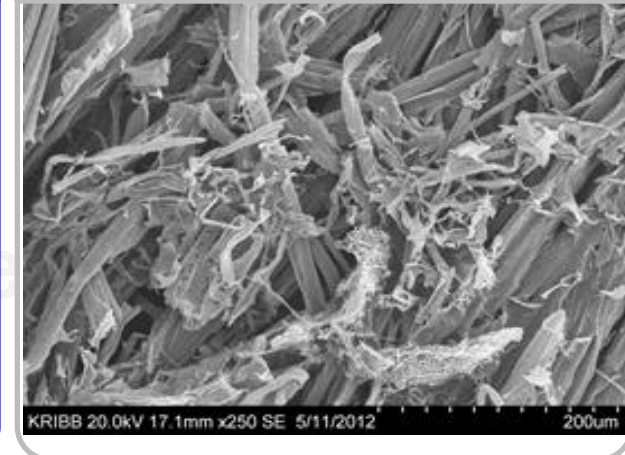
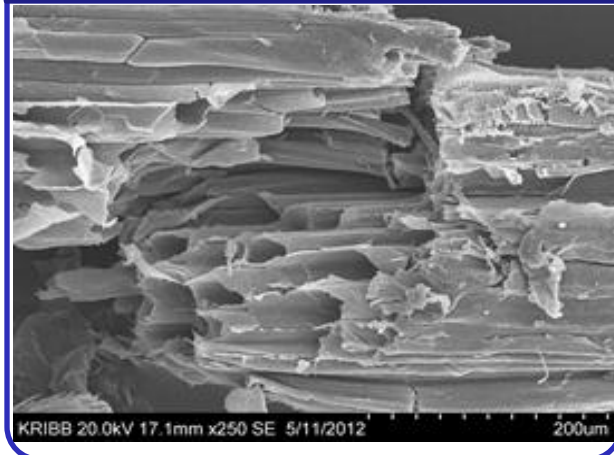
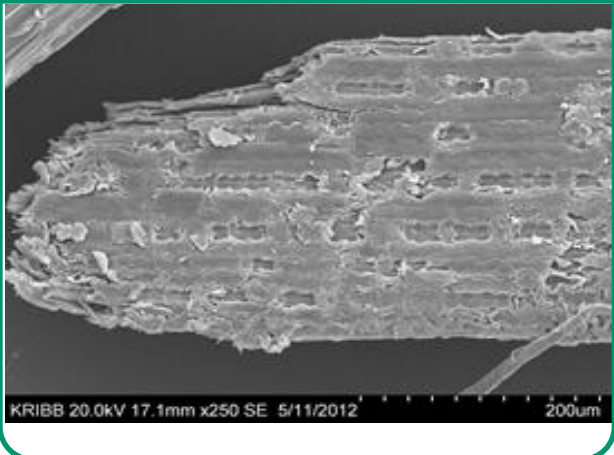


Fig. SEM images(100X, 250X) of various corn stover samples

# Analysis of Production

