HYPERTHERMOPHILIC SINGLE-PEPTIDE FOR DECONSTRUCTION OF CRYSTALLINE CELLULOSE

Tech ID: 33209 / UC Case 2011-002-2

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,334,515	05/10/2016	2011-002

BRIEF DESCRIPTION

Cellulose, the major component of plant biomass, is considered the most abundant biopolymer. Certain microorganisms are able to convert the monomer of cellulose, glucose, into various products useful in the production of biofuels and other methods. Cellulose is highly stable, has a high storage potential, low cost, and plentiful supply. Based on these and other properties, cellulose and enzymes capable of degrading and hydrolyzing it are useful in the sequestration, storage, and production of bioenergy.

Crystalline cellulose is composed of linear polymers of β1-4 linked glucose, held in a tightly crosslinked crystalline lattice by a high degree of intermolecular hydrogen bonding. This structure confers stability but also hinders efficient deconstruction of cellulose. Strategies for commercial depolymerization of cellulose typically combine pretreatment to disrupt the crystalline structure, followed by enzymatic hydrolysis. Disruption of the crystalline structure and chemical hydrolysis typically requires high temperatures and low pH. Enzymatic hydrolysis generally occurs under milder conditions. The degree of pretreatment required and the expense of subsequent cleanup steps are affected by properties of the enzymes used.

Bacteria capable of degrading cellulose include those belonging to the genera *Aquifex, Rhodothermus, Thermobifida, Anaerocellum,* and *Caldicellulosiruptor*. A recombinant thermostable endoglucanase of *Aquifex aeolicus* produced in *E. coli* showed maximal activity at 80° C. and pH 7.0 with a half-life of 2 h at 100° C.

UC Berkeley investigators have engineered a polypeptide having cellulase activity for hydrolysis and degradation of cellulose-containing biomass.

SUGGESTED USES

- Hydrolysis and degradation of cellulose-containing biomass.
- Coversion of lignocellulolytic biomass into soluble sugars for fermentative production of biofuels.

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OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Industrial/ Energy
- **Environment**
  - Remediation
- **Materials & Chemicals**
  - Biological

RELATED CASES

2011-002-2

- Conversion of pretreated lignocelluose into soluble sugars.
- Conversion of lignocellulose into soluble sugars in the presence of high salt or ionic liquids.
- Conversion of crystalline cellulose into soluble sugars at temperatures exceeding 100C.
- Polishing of cotton fabrics under high temperature treatments.
- Production of polished crystalline cellulose for assays of cellulases, expansins, and cellulose binding proteins.
- High temperature applications in pulping of cellulolytic materials.

ADVANTAGES

Using cellulose, and the enzymes capable of degrading and hydrolizing it, for bioenergy sequestration, storage, and production offers many advantages, including:

- highly stable
- high storage potential
- low cost
- plentiful supply

RELATED MATERIALS

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