

Cellulase

CAS # : 9012-54-8

Physical Description: Off white to tan powder

Description: Cellulase refers to a group of enzymes which, acting together, hydrolyze cellulose. It has been reviewed by Emert, et al.⁵ and Whitaker.¹⁰

The enzymatic mechanism whereby certain microorganisms can quite rapidly and completely degrade cellulose is not yet understood. Reese, et al.⁸ proposed that at least two steps are involved: first, a prehydrolytic step wherein anhydroglucose chains are swollen or hydrated and secondly, hydrolytic cleavage of the now susceptible polymers either randomly or endwise. The first step would involve an enzyme designated C₁ and the second, hydrolytic enzymes termed C_c. A third type of enzyme is β-glucosidase.

Multi-enzyme cellulase complexes capable of converting cellulose to glucose contain at least three distinct enzyme components which degrade native cellulose. The action of the C₁ component on cellulose is not well defined. There is no evidence that the component hydrolyzes glucosidic bonds, but rather it appears that the C₁ component disrupts the structure of native cellulose by weakening the hydrogen bonds. The action is required before hydrolysis of highly structured forms of cellulose (cotton, crystalline cellulose, wood, etc.) can occur.

The C_c component consist of β-1,4-glucanases, Exo-β-1,4-glucanase successively removes single glucose units from the nonreducing end of the cellulose chain, while endo-β-1,4-glucanases randomly hydrolyze the interior glucosidic bonds of cellulose liberating oligomers of lower molecular weight.

The β-glucosidases, including cellobiose, are primarily active on the smaller molecular weight cellulose hydrolysates. During cellulose breakdown they are active on the dimers and oligomers of cellulose.

Molecular weight: C₁, 57,000 (Selby⁹); 42,000 (Berghem, et al.³).Endoglucanase (E.C.3.2.1.4), 52,000 (Li, et al.⁷); 23,500 - 58,000 (Beldman, et al.²).Exoglucanase (E.C.3.2.1.91), 60,500 - 62,000 (Beldman, et al.²); β-Glucosidase (E.C.3.2.1.21), 76,000 (Beldman, et al.²).

Optimum pH: Varies with the substrate in the range 4.2 - 5.2.

Unit Definition: One unit will liberate 1.0 umole of glucose from cellulose in one hour at pH 5.0 and 37°C.

CMC Unit Definition: 100 units is sufficient to produce reducing sugar equivalent to 1 mg of glucose per minute at pH 5.0 and 40°C.

Filter Paper Decomposing Activity: One unit is a measure of the decomposing activity on filter paper at pH 4.0, 40°C.

Solubility: Readily soluble in water

Availability:

Catalog Number	Description	Size
101308	Cellulase, from <i>Aspergillus niger</i> , approx. 20,000 cmc units/gm	5 g 25 g 100 g
150583	Cellulase, from <i>Aspergillus niger</i> , activity > 60,000 unit/gm	5 g 25 g 100 g
150584	Cellulase, from <i>Trichoderma virde</i> , activity 1-2 units/mg solid	2 KU 5 KU 25 KU 10 ⁵ U
152337	Cellulase, from <i>Trichoderma virde</i> , activity > 16,000 units/gm of filter paper decomposing activity	500 mg 1 g 5 g

References:

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- Absolute Terms," *Arch. Biochem. Biophys.*, **v. 124**, 129 (1968).
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