



SPEZYME® ALPHA

Alpha-Amylase for Dry Grind Ethanol Production

DESCRIPTION

SPEZYME® ALPHA enzyme contains a thermostable starch hydrolyzing α -amylase that is produced by a genetically modified strain of *Bacillus licheniformis*. The endo-amylase in SPEZYME® ALPHA enzyme hydrolyzes α -1,4-glycosidic bonds to quickly reduce the viscosity of gelatinized starch, producing soluble dextrans and oligosaccharides under a variety of process conditions.

TYPICAL CHARACTERISTICS

Activity: 13,775 AAU/g (minimum)

Appearance: Clear brown liquid

pH: 6.0

Specific gravity: 1.15 - 1.19

UNIT DEFINITION

The activity of SPEZYME® ALPHA is expressed in Alpha Amylase Units (AAU). Enzyme activity is determined by the rate of starch hydrolysis as reflected in the rate of decrease in iodine-staining capacity. One AAU of bacterial α -amylase activity is the amount of enzyme required to hydrolyze 10 mg of starch per minute under specified conditions. A detailed assay method is available upon request.

PERFORMANCE BENEFITS

SPEZYME® ALPHA enzyme provides the following benefits to ethanol producers:

- Quick viscosity reduction allowing for higher solids
- Liquefaction pH's as low as 5.2
- Process flexibility
- Improved performance at low slurry temperatures

APPLICATION RECOMMENDATIONS

SPEZYME® ALPHA enzyme is suitable for use in a variety of liquefaction process designs.

RECOMMENDED OPERATIONAL CONDITIONS

Solids	30 to 36%
Optimal pH	5.7 to 5.8
pH Range	5.2 to 5.9
Optimal Temperature	83 to 85°C (182 to 185°F)
Temperature Range	77 to 88°C (170 to 190°F)
Liquefaction Time	90 to 140 minutes

DuPont's technical sales professionals can provide specific process recommendations based on your objectives and plant characteristics.

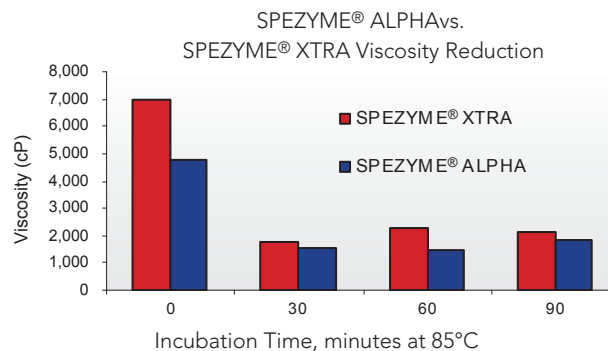


Figure 1 - raw material: corn

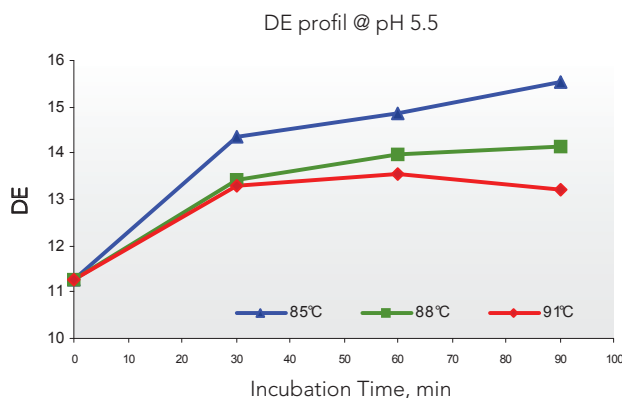


Figure 2 - raw material: corn

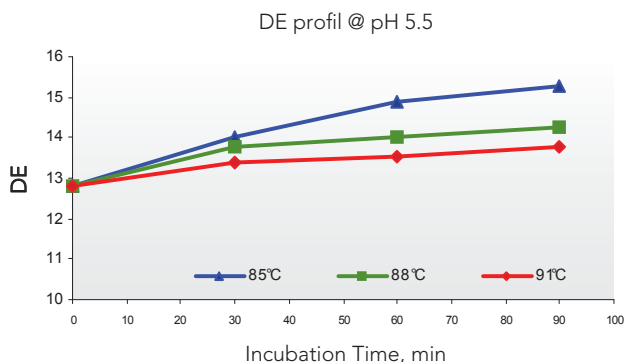


Figure 3 - raw material: corn

DOSAGE RECOMMENDATIONS

The optimal dose for SPEZYME® ALPHA enzyme in slurry and liquefaction depends upon processing parameters such as the type of raw material, viscosity, processing time, pH temperature and DS (Dry Substance). A recommended minimum starting dose for whole ground corn is 0.20 to 0.24 kg per metric ton DS (0.020 to 0.024% w/w). The optimal dose and split between slurry and liquefaction tanks are best determined in actual practice.

REGULATORY STATUS

SPEZYME® ALPHA enzyme complies with current FAO/WHO and FCC recommended specifications for food-grade enzymes and is GRAS (Generally Recognized As Safe) in the United States for use in production of potable alcohol. The enzyme ingredients in SPEZYME® ALPHA are in compliance with the Toxic Substances Control Act in the United States and Domestic Substances List in Canada.

PACKAGING

SPEZYME® ALPHA enzyme is available in various package sizes. Please consult your DuPont representative for detailed information.

STORAGE

To ensure maximum activity, store SPEZYME® ALPHA enzyme in a cool place. Prolonged storage at elevated temperature should be avoided.

SAFETY & ENZYME HANDLING

Inhalation of enzyme dust and mists should be avoided. In case of contact with the skin or eyes, promptly rinse with water for at least 15 minutes.

For detailed handling information, please refer to the appropriate Material Safety Data Sheet, the Enzyme Technical Association (ETA) handbook *Working Safely With Enzymes*, and the Association of Manufacturers and Formulators of Enzyme Products (AMFEP) handbook *Guide to the Safe Handling of Microbial Enzyme Preparations*. All are available from DuPont.

TECHNICAL SERVICE

Information covering specific applications of this product is available. DuPont will work with customers to enhance processes and solve problems. Let us know what you need and we will assist you.

CONTACT INFORMATION

NORTH AMERICA

Rochester, New York (USA)
 ☎ +1 800 847 5311
 ☎ +1 585 256 5295

ASIA/PACIFIC

Singapore
 ☎ +65 6511 5600
 ☎ +65 6511 5666

EUROPE, MIDDLE EAST & AFRICA

Leiden, The Netherlands
 ☎ +31 71 5686 168
 ☎ +31 71 5686 169

Shanghai, P.R. China

☎ +86 21 2307 9588
 ☎ +86 21 2307 9599

LATIN AMERICA

Buenos Aires, Argentina
 ☎ +54 11 4875 9500
 ☎ +54 11 4875 9529

Mumbai, India

☎ +91 22 3008 7131
 ☎ +91 22 3008 7150

SÃO PAULO, BRAZIL

☎ +55 11 4613 3800
 ☎ +55 11 4612 1101

Lahore, Pakistan

☎ +92 300 8476 404
 ☎ +92 423 5437 866

www.dupont.com

Copyright © 2012 DuPont. All rights reserved. The DuPont Oval Logo, DuPont, the Leaf Globe, SPEZYME are trademarks or registered trademarks of E. I. du Pont de Nemours and Company or its affiliates.

USE AND/OR SALE OF THIS PRODUCT MAY BE COVERED BY ONE OR MORE PATENTS IN THE U.S. AND OTHER COUNTRIES, AS WELL AS PENDING PATENT APPLICATIONS IN THE U.S. AND OTHER COUNTRIES.

The information contained in this product literature is, to the best of our knowledge, true and accurate and the product as sold is in conformance with the specifications set forth herein as determined by the assay methods described herein. Due to conditions of use, technical errors or omissions, improper handling or storage beyond our control, Danisco US Inc. hereby DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Danisco US Inc. shall not be liable for any incidental, consequential, or special damages resulting in any way from the furnishing, performance, or use of this product literature or the product described herein.

Nothing contained herein shall be construed as a representation by Danisco US Inc. that the use or resale of the product or processes described herein will not violate any rules or regulations of any countries, regions, localities, etc. or infringe upon patents or other intellectual property rights of third parties or that the recommendations and usage suggestions described constitute any authorization or inducement to infringe any such rights.

This document is subject to change without further notice.

