

Category 1: Lignocellulosic Sugars

Question 1a: To which types of research entities are you willing and able to sell your lignocellulosic sugar (e.g., university researchers, national laboratories, industry/private sector)?

University researchers, national laboratories, industry/private sectors.

Question 1b: Are there any types of research entities to whom you are not willing and able to sell your lignocellulosic sugar?

We have us just started this business and cannot answer this question at this point.

Question 2: What are the maximum and minimum quantities of lignocellulosic sugar you are willing and able to sell (kg)?

We will be able to sell up to 100 L

Question 3: What is the sugar concentration in your product?

100-130 g/L depending on the biomass we use

Question 4: What physical form do you sell your sugars (e.g., solid or liquid)?

We sell sterile filtered hydrolysate in the liquid or frozen form.

Question 5: How do you package your lignocellulosic sugars for shipping? Do you ship in bulk?

We ship them in sterile reagent plastic bottles. Occasionally, we will also ship hydrolysate in 50L sterile containers, in case we need to fill out a bulk order.

Question 6: What type(s) of biomass do you use to produce lignocellulosic sugar?

Corn stover, wheat straw, switch grass, sugar cane bagasse, rice straw, forage sorghum.

Question 7: What process do you use to produce lignocellulosic sugar?

Ammonia Fiber Expansion pretreatment process and commercial enzymes.

Question 8: What details of the scale of your process are you willing to share (e.g. batch and/or continuous/ volumetric productivity)?

We produce our hydrolysate in batch process. Has a capacity to produce up to 5000 L/week scale by subcontracting with pilot scale facility in US.

Question 9: What is the typical composition of your sugar stream (e.g., glucose, galactose, mannose, xylose, arabinose) and what is the purity?

The concentration of sugar in the hydrolysate is dependent on type of biomass and amount of enzyme used during hydrolysis. For corn stover (20% solids), at 3.5 g enzyme/kg biomass, yield 80-85 g/L glucose, 35-40 g/L xylose, 10-12 g/L cellobiose. Other minor sugars galactose, mannose, arabinose can also be measure depending on biomass type.

Question 10: Do you routinely test your cellulosic sugar for consistency within and between lots and between feedstocks (if applicable)?

Every batch of hydrolyzed sugar is subjected to quality control, which includes sugar analysis using HPLC.

Question 11: What impurities are present in your lignocellulosic sugar process and what testing do you perform to determine the presence of impurities?

The monomeric sugar in hydrolysate will have other ingredients like gluco-, xylo- oligomeric sugars, soluble lignin and lignin-derived products. We use NREL protocol to estimate oligomeric sugars. Organic acids present in hydrolysate (acetic acid, lactic acid) are evaluated using HPLC. Other lignin-derived products can be analyzed using LC-MS and GC-MS methods upon request.

Question 12: Does your process include a purification step?

No, there is no purification step involved. We only separate the sugars from solid residues using centrifugation and membrane filtration for sterilization.

Question 13: What is the highest concentration in grams/Liter you can provide?

If necessary, we can concentrate the hydrolysate using freeze drying method. The highest concentration of sugars we can provide will be 200-300g/L. If we don't freeze dry it, we provide sugar concentrations of 100-130 g/L, depending on the biomass we use.

Question 14: Have you examined the impacts of transport and storage on sugar degradation? If so, can you please provide any relevant (non-proprietary) details of these impacts?

When sterile filtered, the sugars are stable for quite long period (up to 1 year) if properly refrigerated. We have not observed issues with the stability of sugars present in hydrolysate for transportation periods of 2-3 days (we've never tested longer transportation periods). Long time storage lead to generation of some precipitated material which was found to be lignin, oligomeric sugars, salts and proteins.

Question 15: What additional information are you willing and able to provide to the research community about your lignocellulosic sugar? Please provide any nonproprietary cost information you are willing to share.

The cost of the lignocellulosic sugar is associated with the volume of hydrolysate ordered. Typically we charge 20% solid loading hydrolysate as follows: 1-5 L (\$200/L); 5-20 L (\$150/L); 20-100L (\$100/L).

Question 16: Into what markets do you typically sell your lignocellulosic sugar? What is a typical application for your lignocellulosic sugar?

We will typically sell the lignocellulosic sugars through our company "Glydia Biotech LLC" website (website under construction). Our customers are primarily from research institutions who will be using these hydrolysate to produce different fermentation products like ethanol, lactic acid, acetic acid etc. In few cases, they use the hydrolysate to grow algae or to produce oleaginous yeast. In some cases, they use the hydrolysate for boosting the anaerobic microbe's growth during anaerobic fermentation for producing biogas. Some researchers use them for catalytic conversion to different products.