

Request for Information (RFI) DE-FOA-0001615: Cellulosic Sugar and Lignin Production Capabilities

Response from Borregaard AS, Hjalmar Wessels vei 6, 1721 Sarpsborg, NORWAY
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Category 2: Lignin

Question 1: To which types of research entities are you willing and able to sell or otherwise provide your lignin? (e.g., university researchers, national laboratories, industry/private sector)? Are there any types of research entities to whom you are not willing and able to sell your lignin?

Borregaard sells lignosulfonate (sulfonated lignin) on a commercial basis. Samples are provided free of charge. Industry/private sector are recommended to contact one of Borregaard's sales offices. Academic requests are evaluated case by case. Samples are generally provided under MTA.

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

Borregaard is the world's largest producer of lignosulfonate. Please contact a sales person for volumes and pricing.

Question 3: In what units do you sell your lignin and is it packaged (e.g., super sacks), or sold in bulk?

A wide range of packaging is available, depending on the customers requirements.

Question 4: How do you ship lignin?

By road, rail or sea.

Question 5: What is the lignin concentration in your product?

Liquid lignosulfonate is typically provided in aqueous solutions with a dry matter >45% or as powder with a dry matter >90% .

Question 6: What type(s) of biomass do you use in your process?

Borregaard provides lignosulfonates from softwood and hardwood.

Question 7: What process do you use that produces lignin (dilute acid, ammonium fiber expansion (AFEX), hot water, organosolv, etc.)?

Borregaard's lignin comes from sulfite pulping. To be very specific the lignins are salts of lignosulfonic acids, with sodium, magnesium, ammonium or calcium as a counter ion.

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

Borregaard does not share any details on the lignin process.

Question 9: Do you measure the typical composition of your lignin? If so, what method do you use? How consistent is the composition of your lignin?

Composition and other performance parameters of the lignosulfonate products are routinely followed up by our quality control department.

Question 10: Do you routinely test your lignin for consistency within and between lots?

Yes

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

We can't provide details about this on a general basis, but the production process and the lignosulfonate products are continuously monitored.

Question 12: Does your process include a purification or filtration step?

Borregaard does not share details on the lignosulfonate process.

Question 13: What is the typical concentration in g/L you can provide?

Liquid lignosulfonate is typically provided in aqueous solutions with a dry matter >45%.

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

Yes. Borregaard will ensure that customers receive a lignosulfonate with the performance that has been promised.

Question 15: What additional information are you willing and able to provide to the research community about the lignin? Please provide any non-proprietary cost information you are willing to share.

Borregaard does not share details on the cost of lignosulfonates.

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

Please refer to Borregaard's homepages: <http://www.borregaard.com/Business-Areas/Performance-Chemicals> and <http://www.lignotech.com/>