TECHNICAL BULLETIN

PERFORMANCE OF BORREGAARD'S BIOPOLYMERS IN DISPERSE DYES

Borregaard

OVERVIEW

Borregaard's lignin-based dispersants are used either individually or in combinations to serve the specific needs of a customer's operation. The choice of dispersant(s) is dyestuff and process dependent.

STAINING

The degree to which a dispersant will stain fibres is a function of its colour, affinity to the fibre and the dyeing process. We offer products for use as primary and secondary dispersants with outstanding low to moderately staining properties.

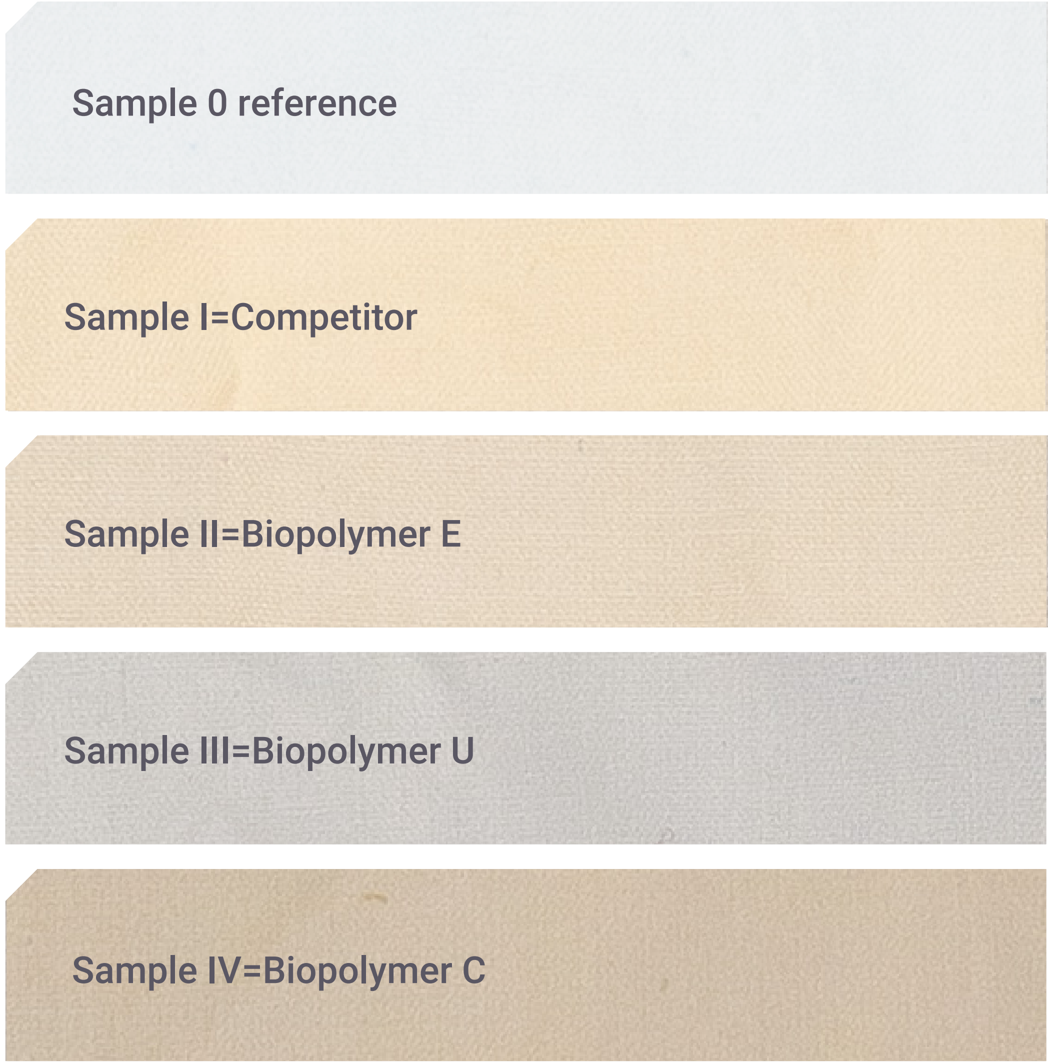


Figure 1 Staining probes after adding 3% of dispersant and a staining program at 130°C.

Test conditions

Staining was measured by impregnating the textile with 3% of dispersant at pH 4.5 following a Mathis Labomat stain program which calls for a gradual increase in temperature to 130°C over 60 min. The textile sections are then rinsed and dried, and Minolta brightness was measured. The degree of staining is calculated as the brightness of the sample divided by the brightness of the blank and is represented in Figure 2. The higher the bar, the higher the degree of staining.

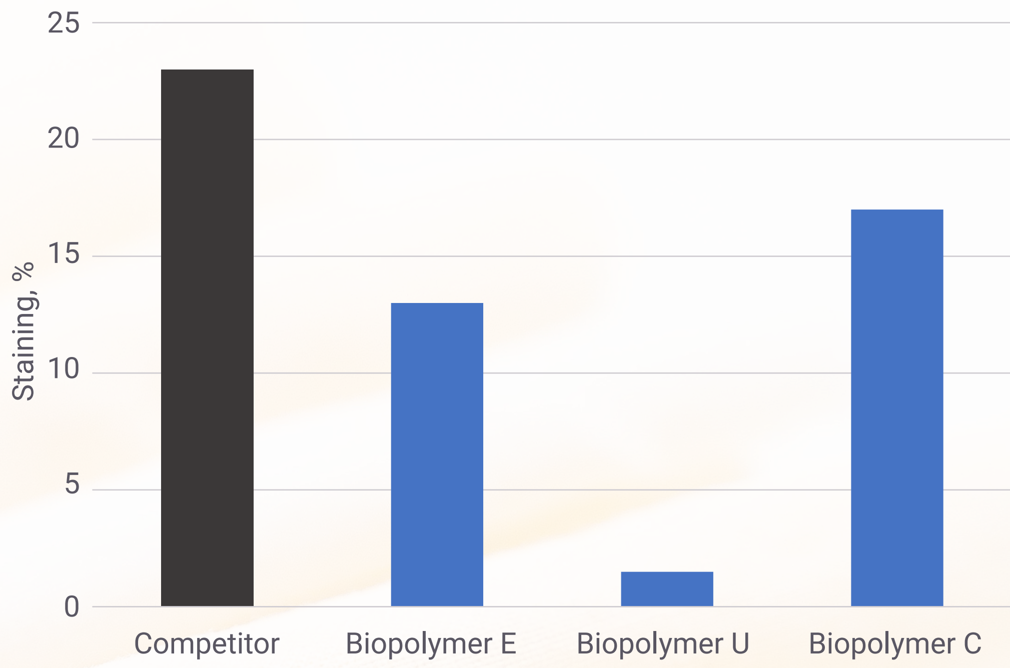


Figure 2 Percentage of staining of different Borregaard lignin-based biopolymers against common competitor product

HEAT STABILITY

The stability of a dyestuff at high temperatures is essential and often determines the success or failure of a dyeing operation.

Our dye dispersants improve heat stability, which can be attributed to the unique adsorbent and solubility groups present in the dispersants. The relationship between these groups has a direct impact on the temperature stability of a dyestuff at high temperatures.

Borregaard biopolymers provide heat stability in low to high energy dye formulations.

Test conditions

Heat stability tests (Figure 3) were conducted in a Zeltex Colorstar CS-2. PES yarn was wound onto 30 g spools. Disperse Blue 79 formulated with a non-heat stable dispersant is added to the dye bath (2% addition OWG[1]). Then 0.5 g/L of the dispersants were added, heated to 130°C and maintained for 30 min, cooled and checked. Delta pressure readings of the pump imply flowability of the dye formulation, thereby identifying the relative heat stability of the dispersant in the formulation. The lower the delta pressure the more heat stable the dispersant.

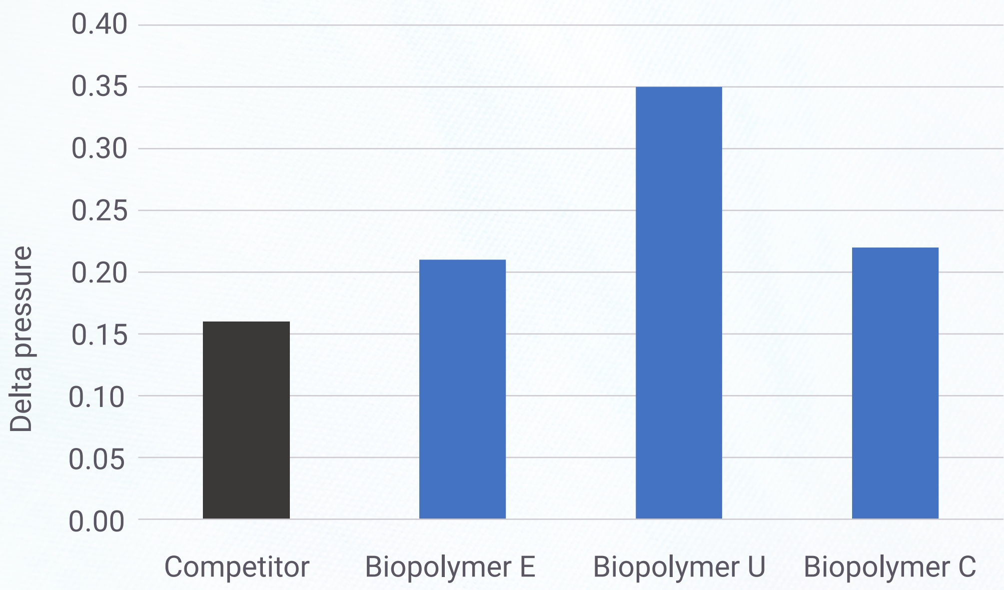


Figure 3 Delta Pressure as indication of heat stability for different Borregaard lignin-based biopolymers compared with common competitor product

[1] OWG: On weight of goods

Figures 2 and 3 show the relative staining and heat stability of our biopolymers compared to the competitor. Our biopolymers while not quite equaling the heat stability of the competitor are superior in staining characteristics.

AZO REDUCTION

Colour loss in azo dye systems is the result of nitrogen bond breakage in the dye structure. Our secondary dispersants contribute to lower azo bond reduction and improved coloration due to less interference with the dye structure.

MILLING ECONOMY

Improving grinding efficiency equates to the reduction of the milling time required to achieve a desired particle size. We offer several lignin-based dispersants, which provide improved formulation economy. As can be seen in 4, Borregaard dispersants can work at higher solids concentrations enabling milling at higher solids and spray drying at higher temperatures which makes the process more efficient and saves energy.

Grinding particles to colloidal size increases the surface energy considerably. When a dispersant is adsorbed onto the dye particle, the surface energy is decreased, thus stabilizing the system. Fast adsorption of the dispersant and good repulsion between the particles improves grinding efficiency and stability of the dispersion.

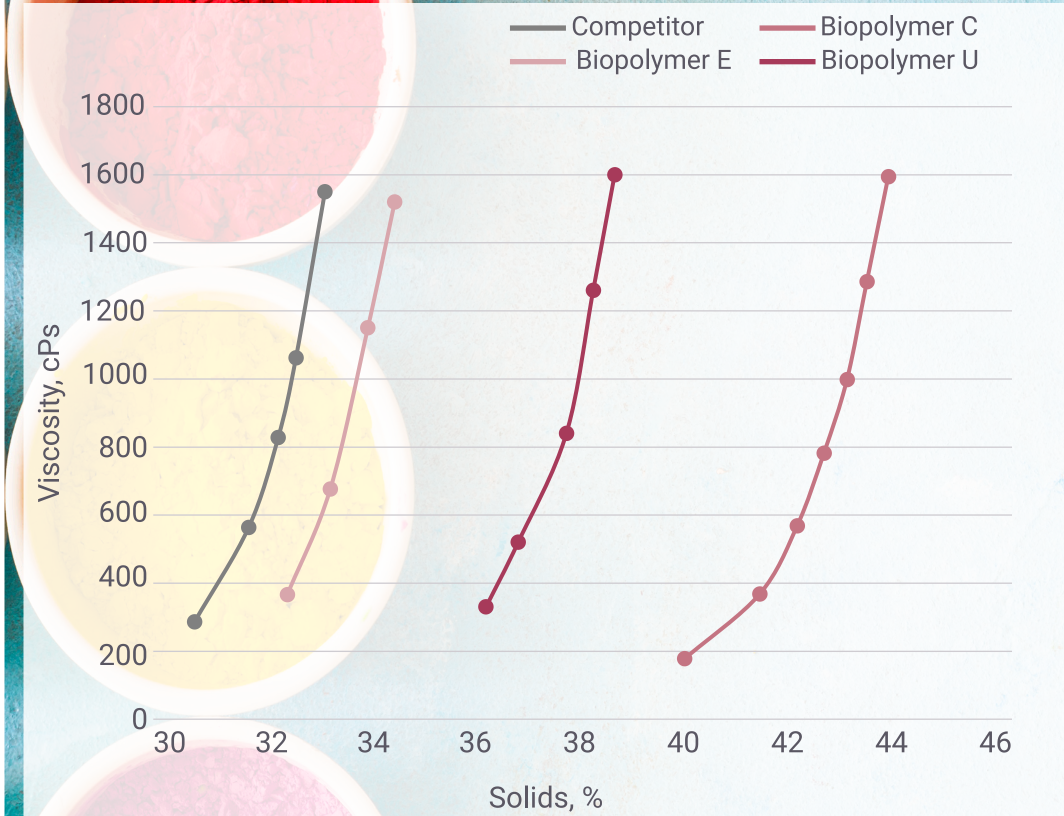


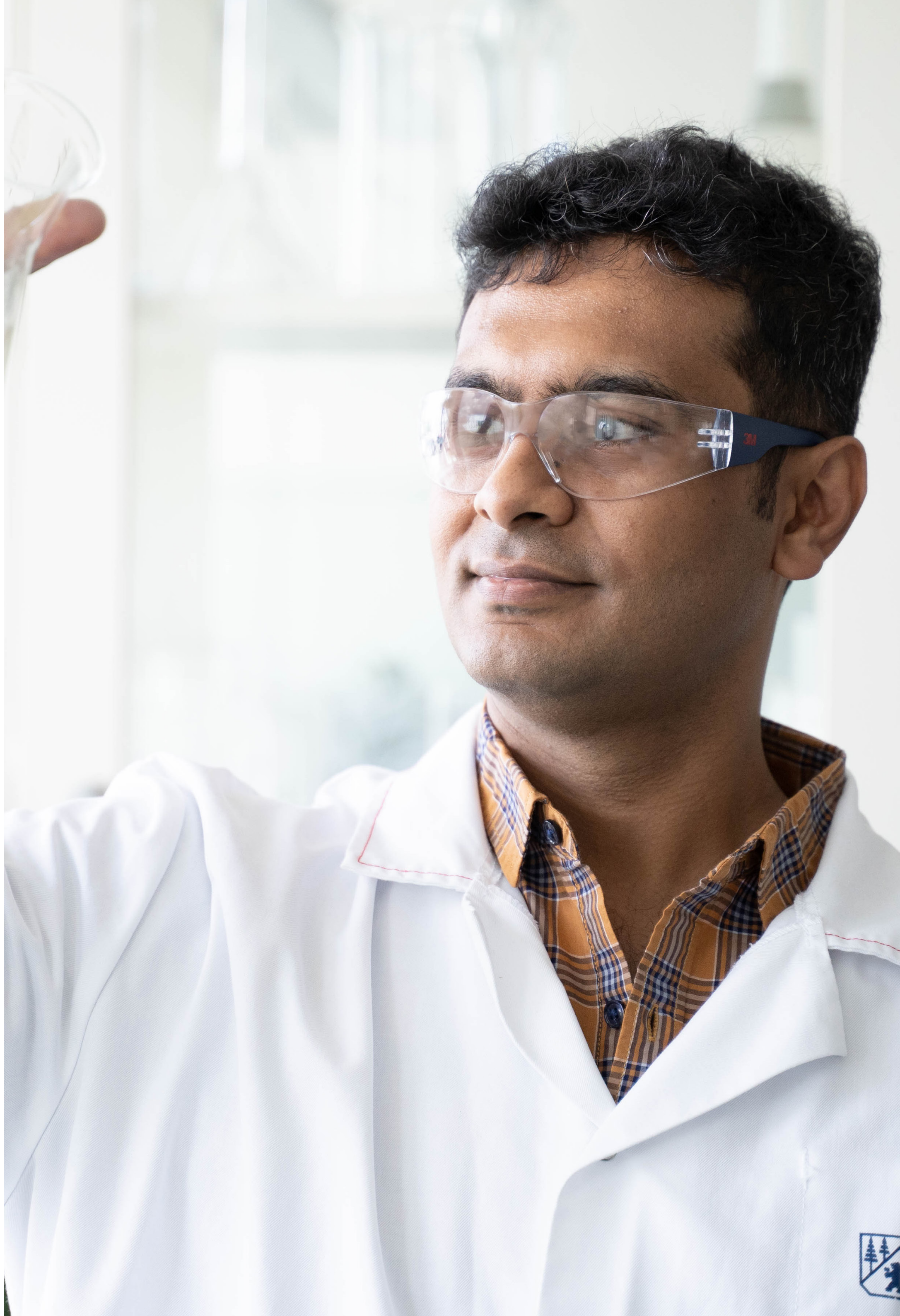
Figure 4 Viscosity of different Borregaard lignin-based dispersants in water compared with common competitor product

CONCLUSIONS

The selection of the dispersant(s) is often a compromise between different properties like heat stability and staining. The figures show that Borregaard biopolymers are low to moderate in staining and also provide heat stability close to a commonly used dispersant. Plus they contribute to lower azo bond reduction, improved coloration and increased milling efficiency by enabling operating at higher solids.

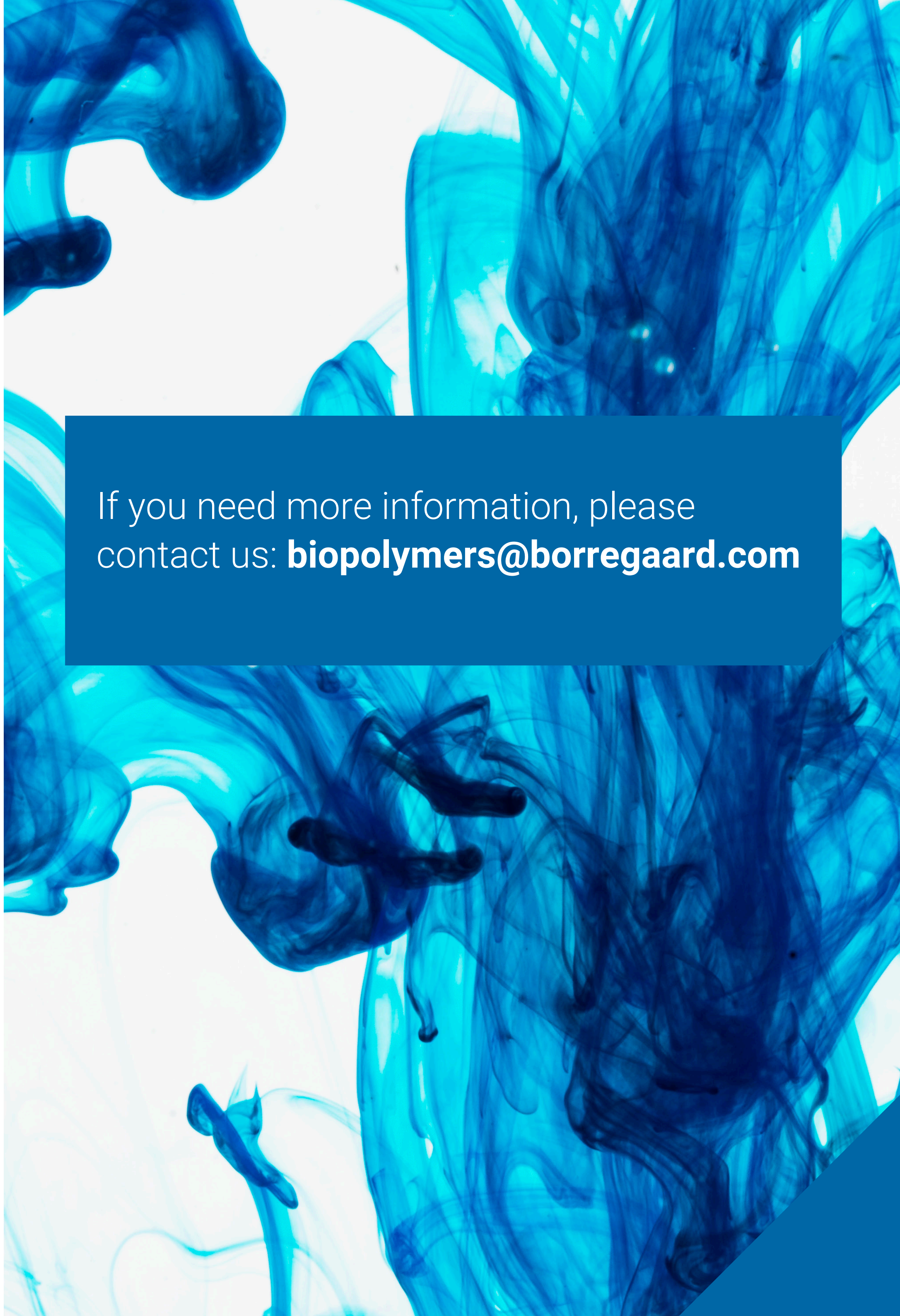
Besides improved cost/performance, the use of Borregaard's biopolymers can help improve the sustainability profile of your processes and products.

Our technical team can help you select the best product for your specific requirements.



ABOUT US

Borregaard operates the world's most advanced and sustainable biorefinery. By using natural, sustainable raw materials, Borregaard produce advanced and environmentally friendly biochemicals and biomaterials that replace oil-based products. Our world-wide network of production facilities and sales offices assures the very best local service and competence where you need it. For us, providing our customers with the most dedicated technical assistance is key. Therefore, the company invests considerable resources in research and development. We continuously strive to develop wood based renewable products for new applications, and through that we contribute to delivering alternatives to oil based synthetic products in a wide variety of industries.



If you need more information, please contact us: **biopolymers@borregaard.com**