THE NATURAL PERFORMANCE ENHANCER

TECHNICAL BULLETIN

STRENGTH AND BARRIER ENHANCER

EXILVA CELLULOSE FIBRILS – AN EXCELLENT FILM FORMER

Exilva has excellent film forming properties. Exilva will increase the mechanical strength as well as barrier and surface properties of various applications, like coatings, paper and packaging.

The applicability of Exilva to be used in industrial coating machines was tested by producing continuous film with semi-pilot scale surface treatment line (SutCo, Technical Research Centre in Finland, VTT). The produced film was 10 m in length and it was cut into A4 sheets and the "Exilva" logo printed on it using ink-jet printer.

FIGURE 1: *Exilva films made by casting containing 30% of sorbitol. The films are 35 µm thick and the printing has been made with ink-jet printing.*

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A product by Borregaard

STRENGTH AND BARRIER PROPERTIES

The Exilva film manufactured with surface treatment line showed excellent tensile properties. Table 1 summarizes the mechanical properties of the film and compares it with some other materials. The Exilva film has high tensile strength and strain at break, indicating strong and flexible material.

Material	Tensile strength, MPa	Strain at break, %	Modulus, GPa
Exilva film	90	13.7	3.3
Copy paper (MD)	50	3.0	–
Polypropylene	40	100	–

TABLE 1: *Mechanical properties of the Exilva films compared to typical values of some other materials.*

In addition to the mechanical properties, the films make a very good oxygen barrier. Table 2 compares Exilva film with some typical packaging materials. Low oxygen transmission value makes the film suitable for food packaging applications.

Material	Oxygen transmission rate cc/m2 x day
Exilva film	2.3
Cellophane	7
Polylactid acid	18
HDPE	24

TABLE 2: *Oxygen transmission rate for Exilva films compared to typical values of some other materials.*

EXPERIMENTAL DETAILS

MANUFACTURING OF THE FILM:

Exilva 10% suspension was first diluted to the correct concentration under high shear mixing for 60 min. Then 30% w/w sorbitol (of dry weight MFC) was added and the mixing was continued for 60 min. The suspension was deaerated and casted on a moving web. Drying was done at ambient conditions for 12 h. Printing was performed on a carrier using ink-jet printing (HP OfficeJetPro 8720).

Mechanical properties were measured in machine direction using Lloyd 1000R tensile tester (Lloyd Instruments Ltd), with a 100 N load cell at 23°C temperature and 50% relative humidity. Width of the strips was 15 mm. The gauge length and crosshead speed were 20 mm and 2 mm/min.

OTR measured according to ASTM D3985.