

TMS 211 Fiber Library

Hemp

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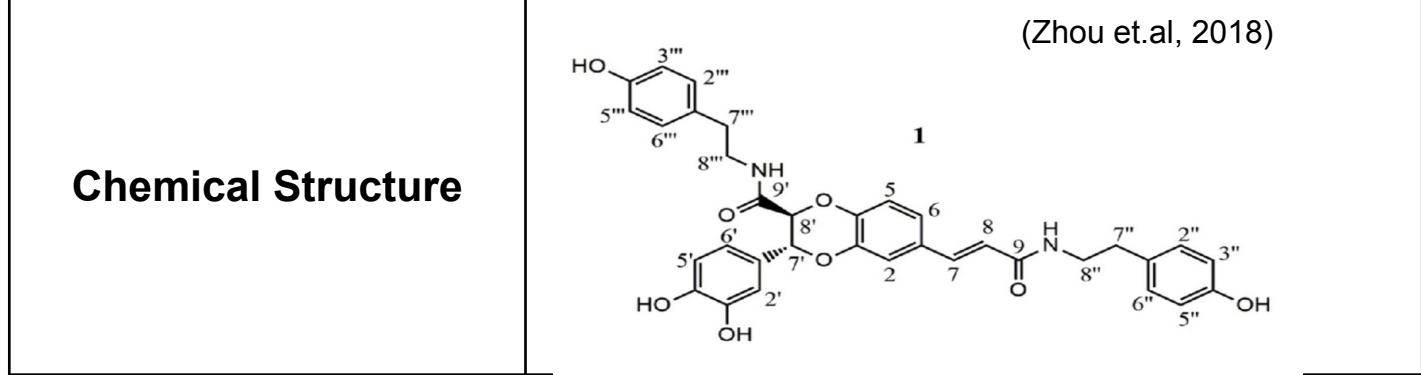
North Carolina State University

Spring, 2024



Fiber Classification Cannabis Sativa L.

Fiber density 1.52 g/cm³ (cotton but prof said to use from fiber density chart in moodle)



Brand name and/or Major manufacturer Manufacturer: Hemp Fortex (Our Fibers, 2024)
 Established: 1999
 Hemp Growth: Northern China
 Website: www.hempfortex.com

Typical Fiber Applications & Properties

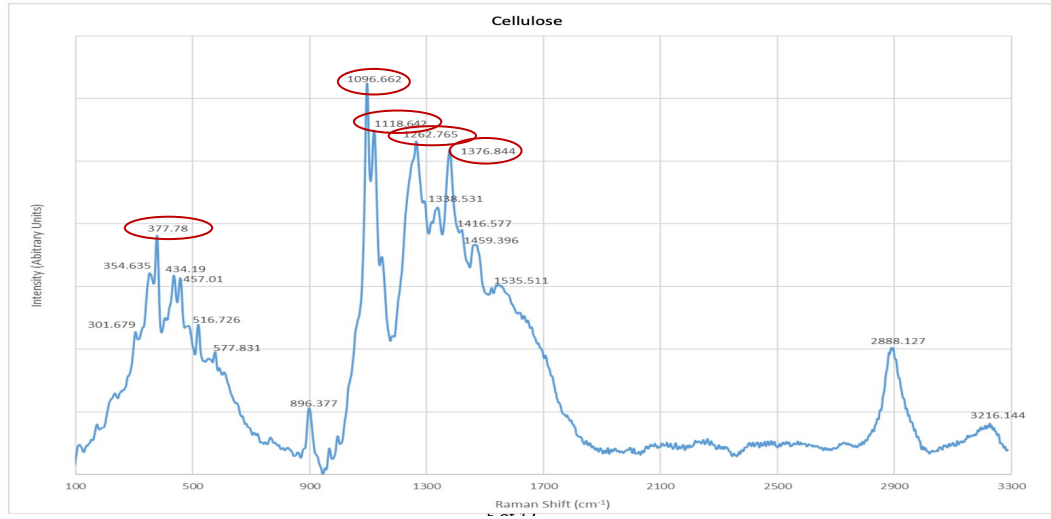
Applications: automotive/constructional/textiles/fiber oil/medicine (Eichhorn, 2022)
 Properties: absorbent, resistant to UV, resistant to mildew. (Hemp, 2024)

Additional Facts

The Marijuana Tax Act 1937 banned hemp in the United States due to competition with other natural fibers and propaganda.

(Why Hemp was Outlawed, 2024)

Raman Spectra



Major Raman Peaks at: 377.78, 1096.662, 1118.642, 1262.765, 1376.844

Flammability

Approach	Because it is cellulosic it will not shrink from the flame
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In-Flame	Once it ignites, it will continue to burn on its own. It has an reddish small flame & turns black.
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Remove/R eside	Leave a light, feathery ash, characteristic smell of burning paper
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Steps of Hemp Production

Harvesting

- 70 to 90 days to grow
- Harvested for textiles in the early flowering stage before the seed is produced
- After plant is cut it is dried out for a few days

Retting

- Moisture & Microbes to break down chemical bonds that hold the stem together
- Retting takes 4-6 weeks naturally
- After the retting is finished, 15% of the stock is bailed

Fibre Separation

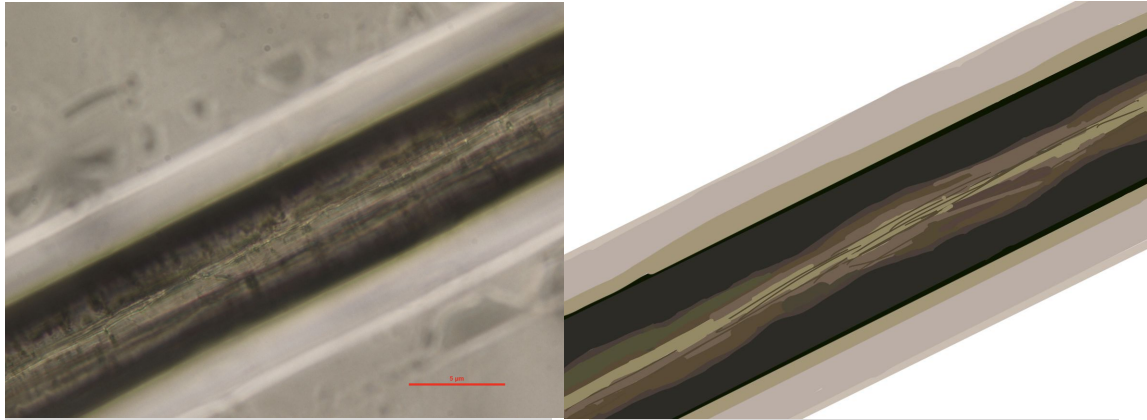
- Breaking of stalks is required
- Put through decorticator
- Scutching shapes hemp into short fibers



(How Hemp Fibre is Produced, 2024)

Hemp

Longitudinal



Magnification
400x

Magnification
400x

Cross-section



Magnification
400x

The longitudinal view of the hemp fiber shows a straight line. Within the center of the fiber there is a stringy texture at the medulla. The structure is consistently solid.

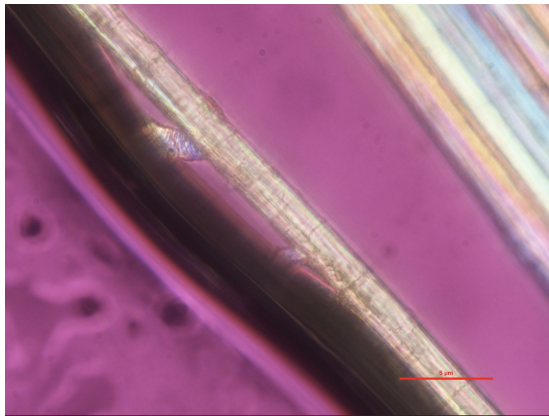
The cross-section of the fiber is a grainy texture It looks broken up into different pieces and has a an overlapping structure. The different sections also have a fluffy texture.

Diameter (μm)	7.098	7.139	6.893	6.791	7.120	Average Fiber Diameter	7.0028 μm	
	7.161	6.792	6.978	7.139	6.917			

Hemp

Under Cross polarization: Extinct at _NS-EW_

Polarized Light- Red Plate (NW-SE)



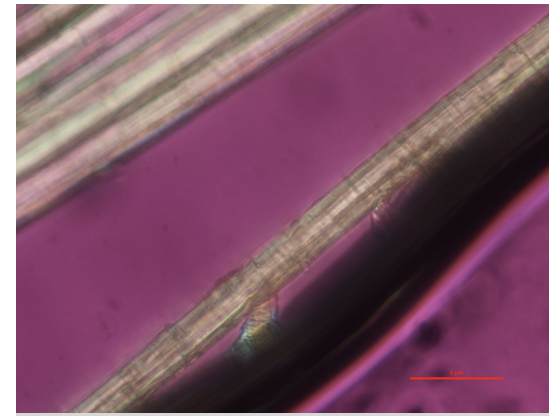
Magnification 400x



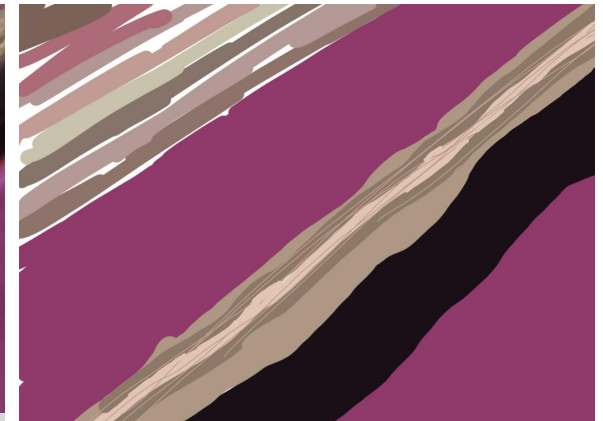
Magnification 400x

This direction does not show the fiber extinct. The fiber is bright & has a string-like pattern & texture. There is a cluster of fibers in the top-right corner of the picture also have a stringy texture, but are blurred.

Polarized Light- Red Plate (NE-SW)



Magnification 400x



Magnification 400x

This direction does not show the fiber extinct. The fiber is darker than the NW-SE angle, however it still possesses the stringy texture and pattern. The fiber is more defined at this angle as the core of the fiber is also better exposed.

Hemp

• References

Eichhorn, S. (2022). *Hemp Fibre Properties and Processing Target Textile: A Review*. Pubmed Central .

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