

Le chanvre et ses applications

Dr Michel Vignon

Directeur de Recherche au CNRS
CERMAV Grenoble

Equipe Structure et propriétés des glycomatériaux



Pourquoi le chanvre...

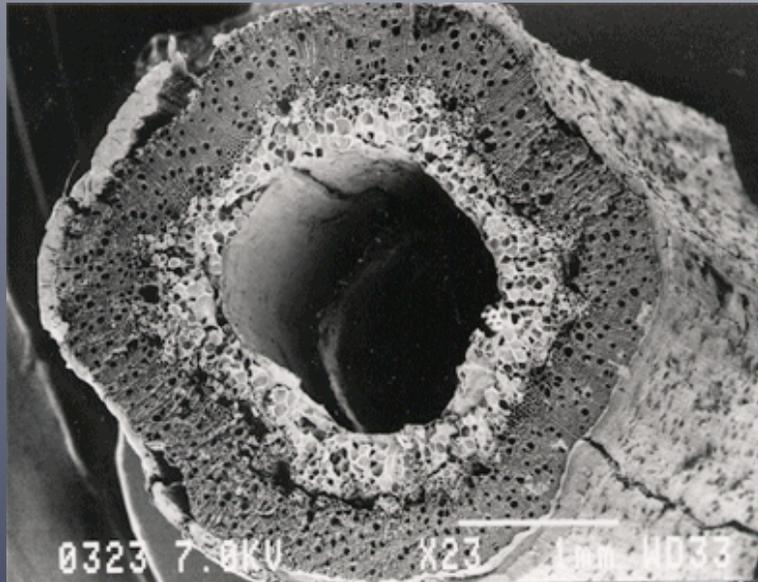
- Rendement : 8 T/ha
- Culture : peu d'intrants, peu de traitements
- Transformation mécanique sans produits chimiques
- Valorisation de tous les constituants

LE CHANVRE S'INSCRIT DONC DANS UNE DYNAMIQUE DE DÉVELOPPEMENT DURABLE

Comparison of physical properties of various fibres*

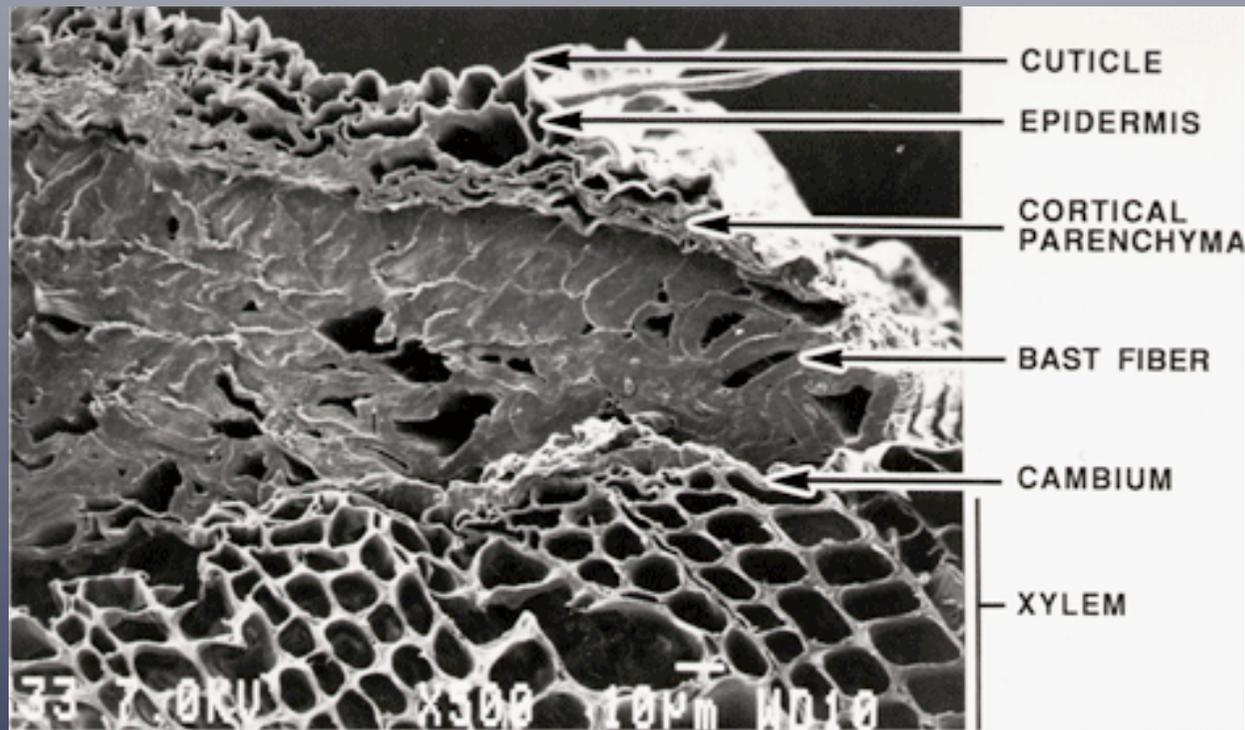
	Tensile strength (GN/m ²)	Modulus of elasticity (GN/m ²)	Density (kg/m ³)	Elongation at break (%)
Flax	1	60	1500	1.5
Hemp	0.7	32	1480	2.0
Jute	1	59	1500	1.5
Ramie	0.67	24	1510	4.0
Abaca	0.64			3.0
Sisal	0.53	36	1450	3.0
Cotton	0.32			8.0
E-glass	2.6	73	2470	
Kevlar 29	2.7	60	1450	
Carbon (high modulus)	1.9–2.3	350–420	1900	

Constitution de la plante

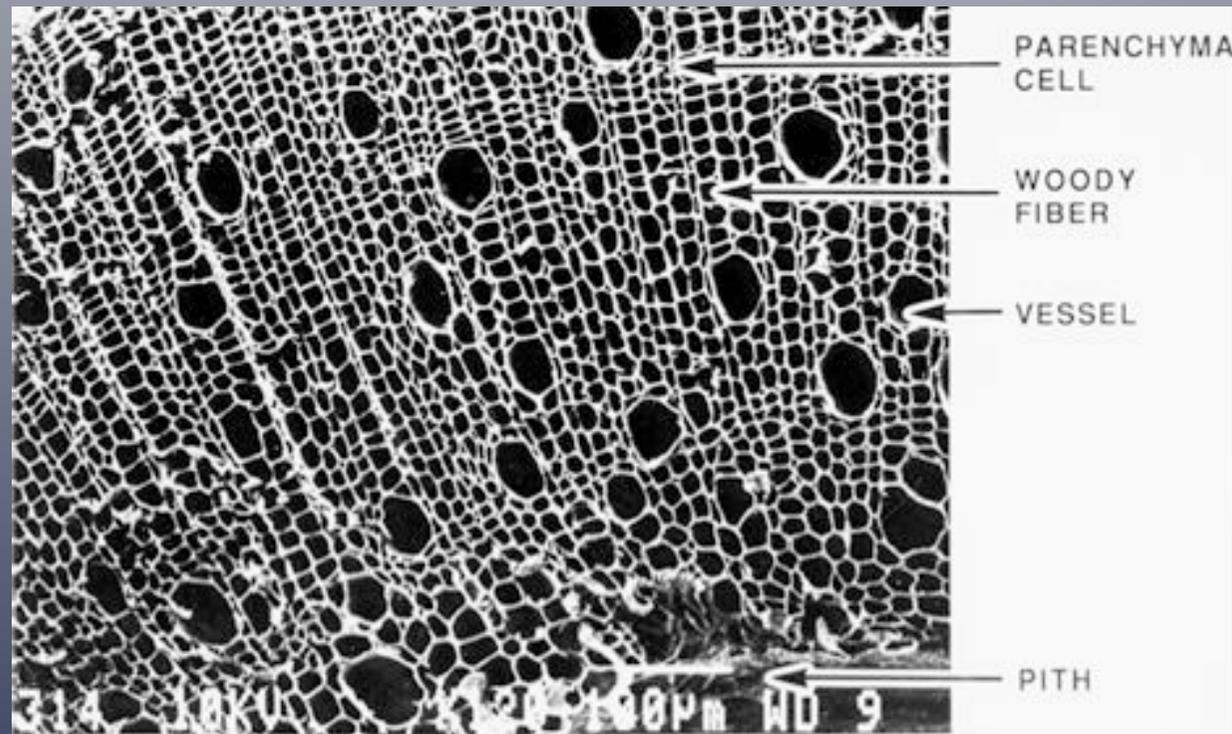


Coloration carmino-vert de Mirande

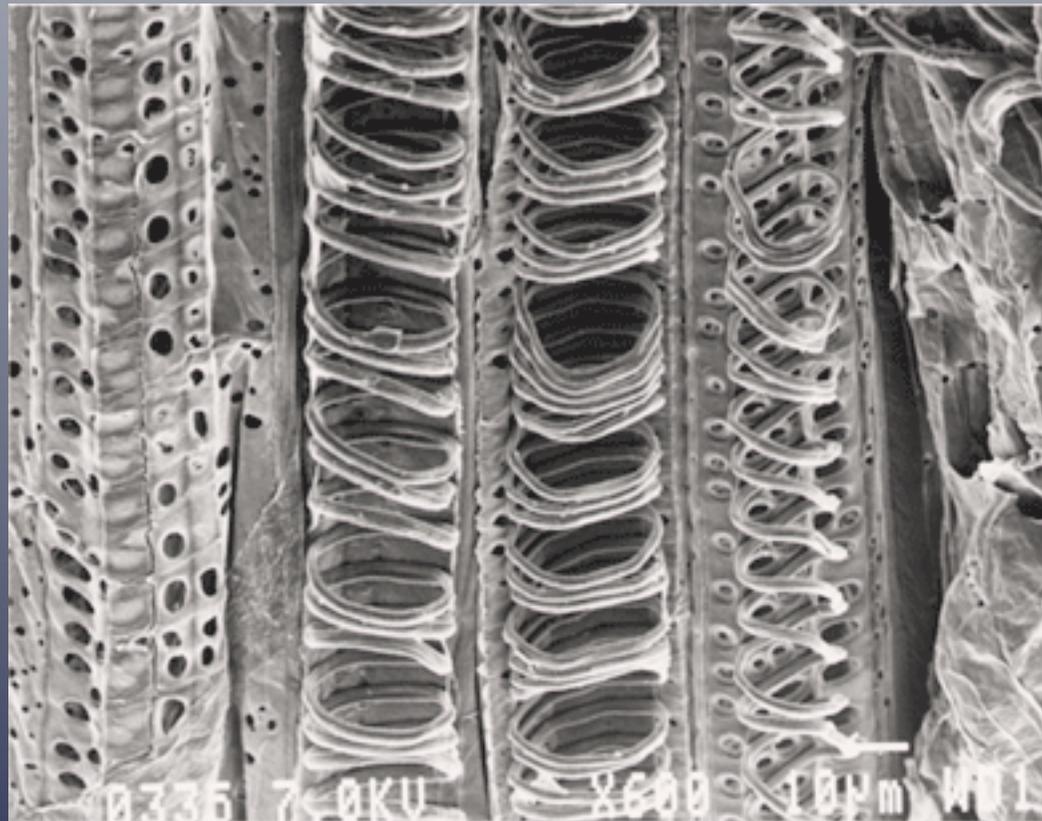
Caractérisation morphologique



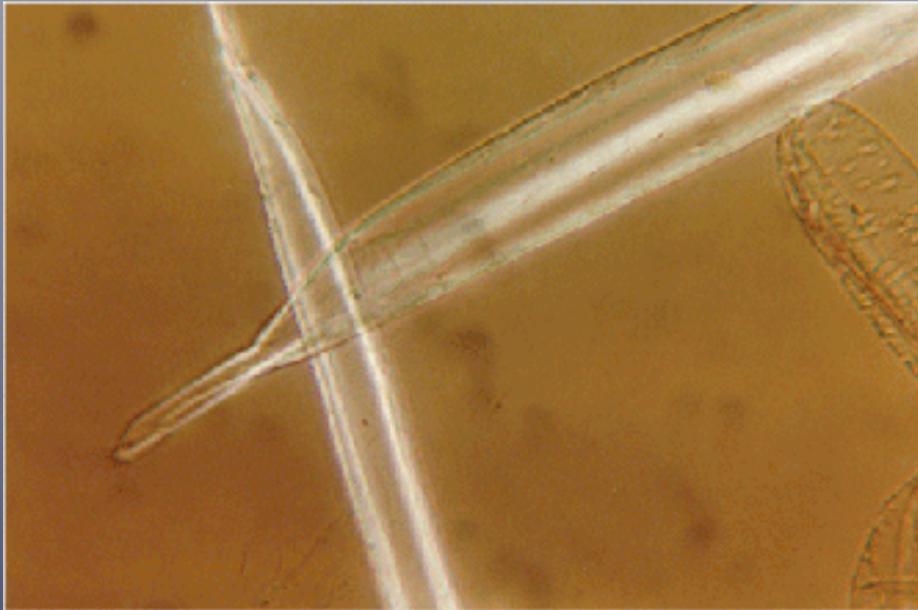
Caractérisation morphologique



Caractérisation morphologique



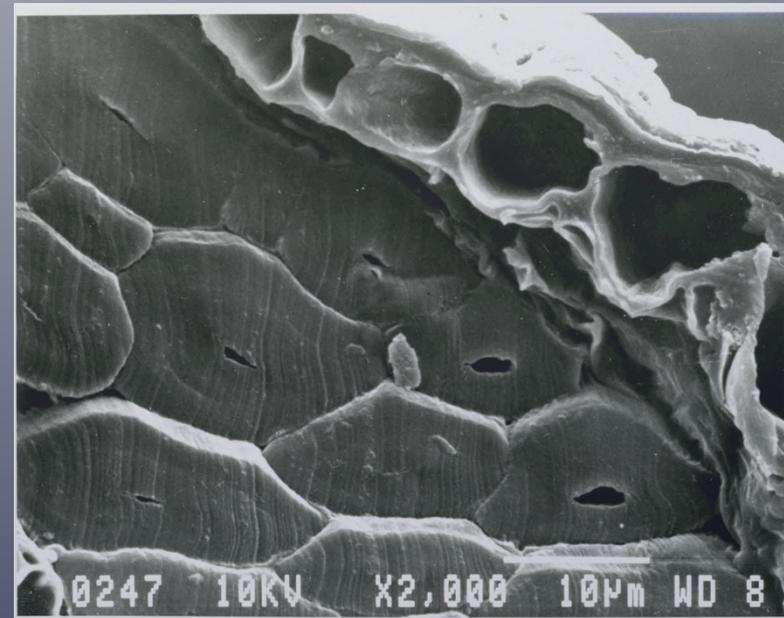
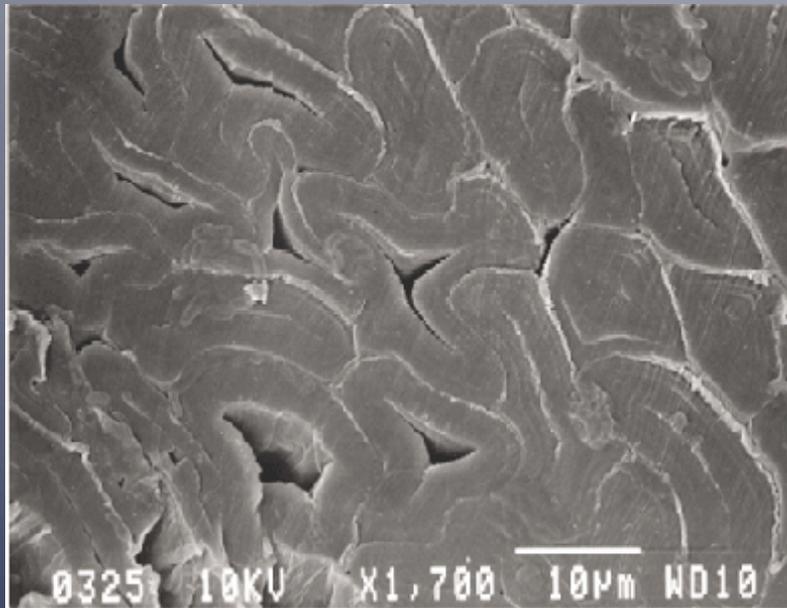
Caractérisation morphologique



Dimensions of hemp fibres

	Ultimate bast fibres	Wood fibres
Length (mm)	5-55	0.2-0.6
Diameter (μ m)	20-40	10-30
Wall thickness (μ m)	5-10	1

Comparaison fibre chanvre – fibre lin



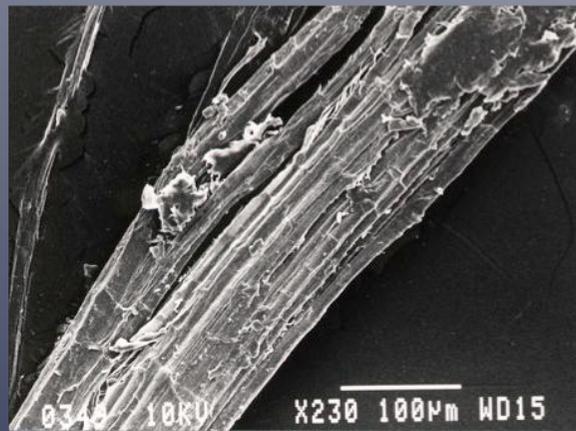
Composition chimique du chanvre

	Cellulose	Hemicelluloses	Pectins	Lignin	Wax + fat	Ash	Protein
Bast fibres	55	16	18	4	1	4	2
Woody core	48	12	6	28	1	2	3

	%Sugar							Neutral sugars/ acidic sugars
	Glc	Gal	Man	Xyl	Ara	Rha	GalA	
Bast fibres								
Raw material	66	2	6	1	3	1	4	20
After chemical extractions + bleaching	84	—	1.5	0.7	—	—	—	—
After STEX, NaOH + bleaching	95	—	2	1	1	—	1	99

Purification chimique de faisceaux de fibres de chanvre

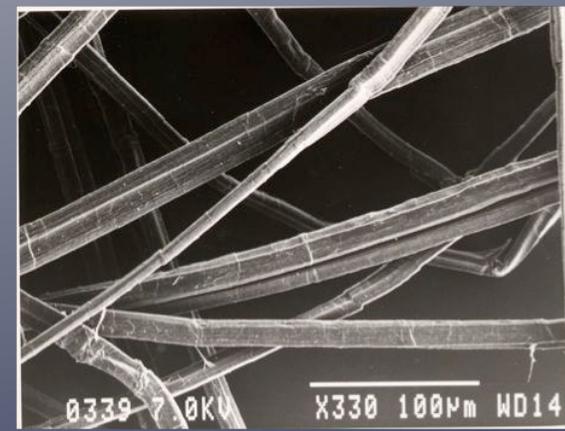
après rouissage des tiges



H₂O



NaOH



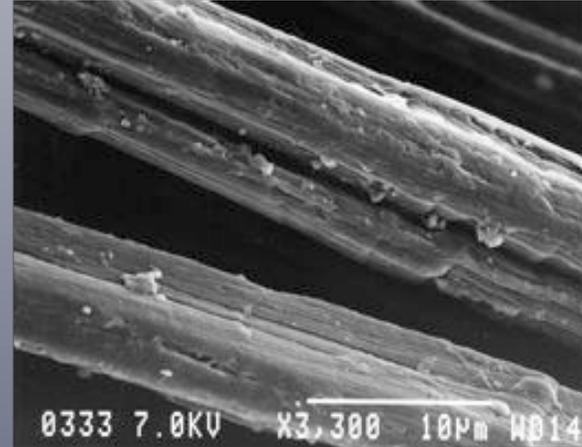
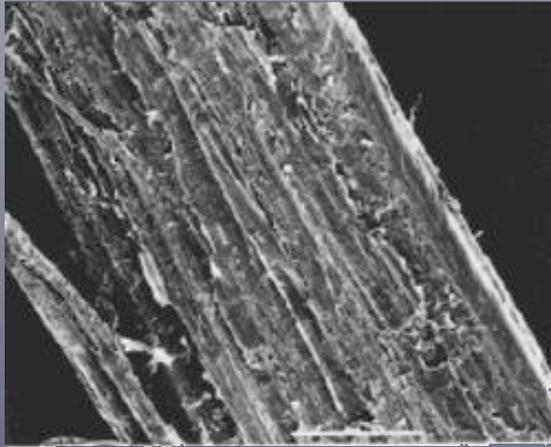
NaClO₂

Pilote d'autohydrolyse rapide



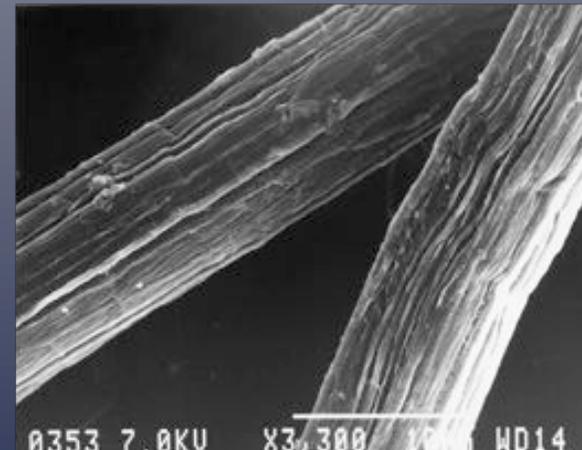
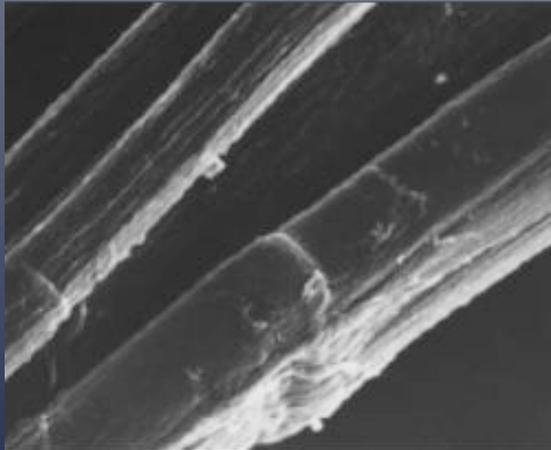
Filasses de chanvre après explosion à la vapeur

Brute



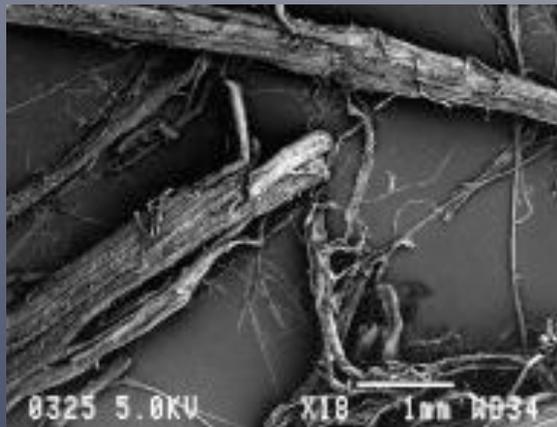
H₂O

NaOH

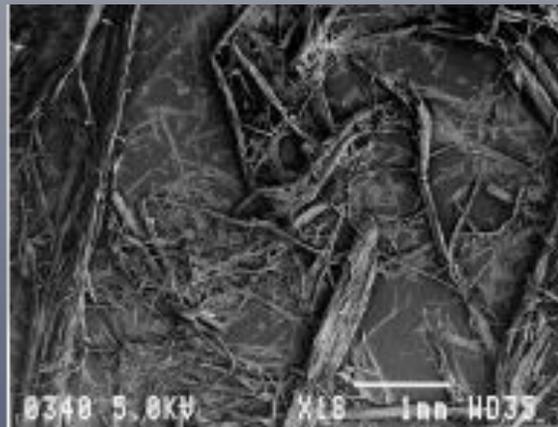


NaClO₂

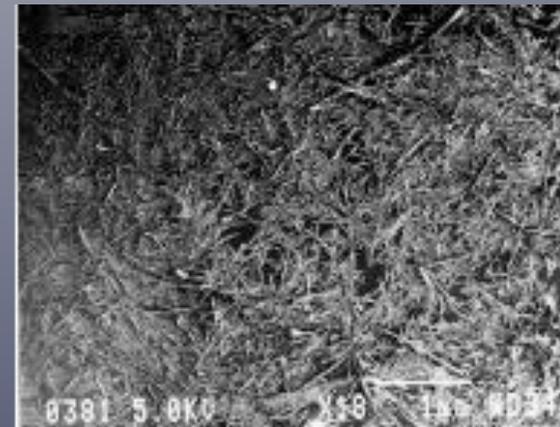
Chènevotte après explosion à la vapeur



210 °C



221°C



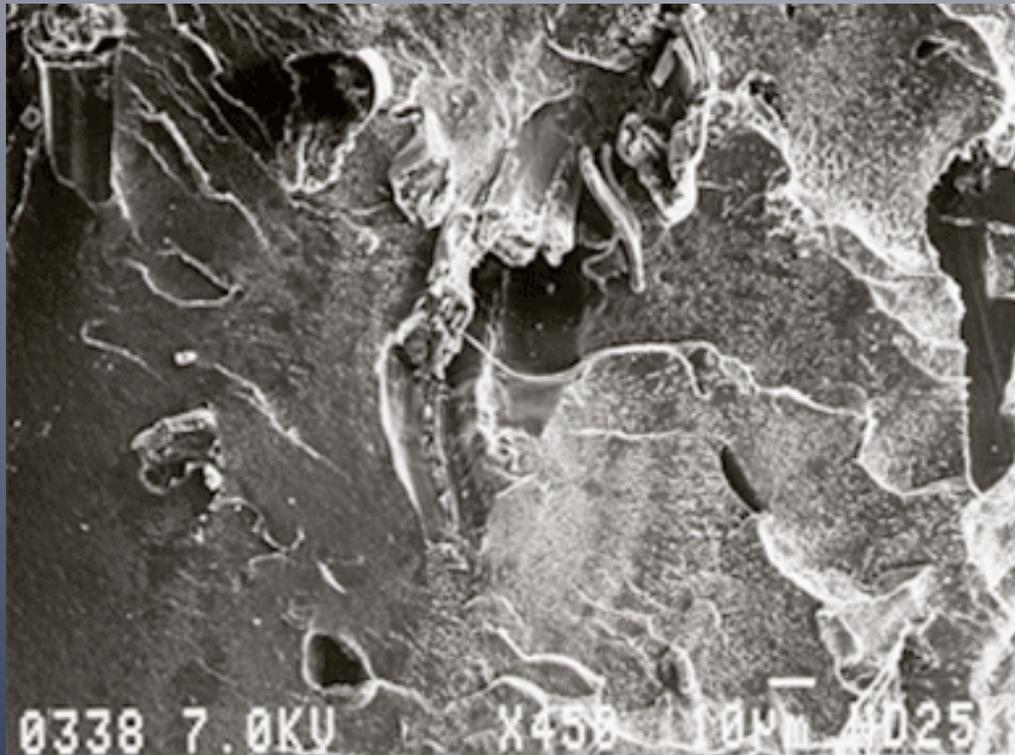
245°C

Composites renforcés par des fibres corticales de chanvre



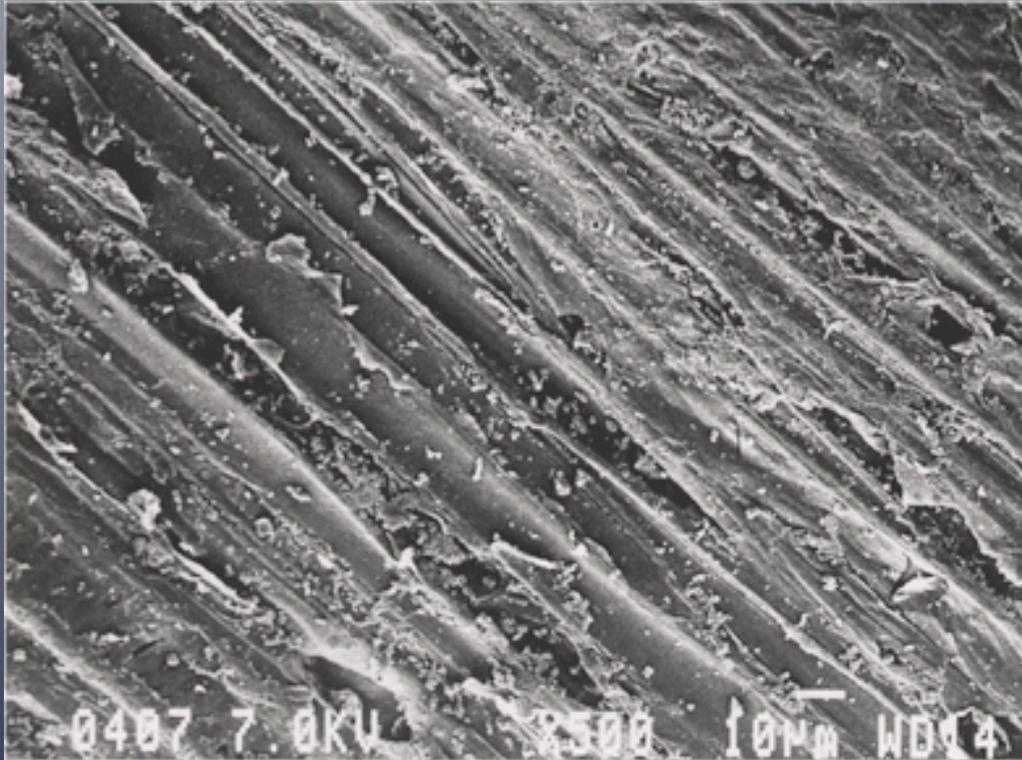
Polypropylène
+ fibres non
prétraitées

Composites renforcés par des fibres corticales de chanvre



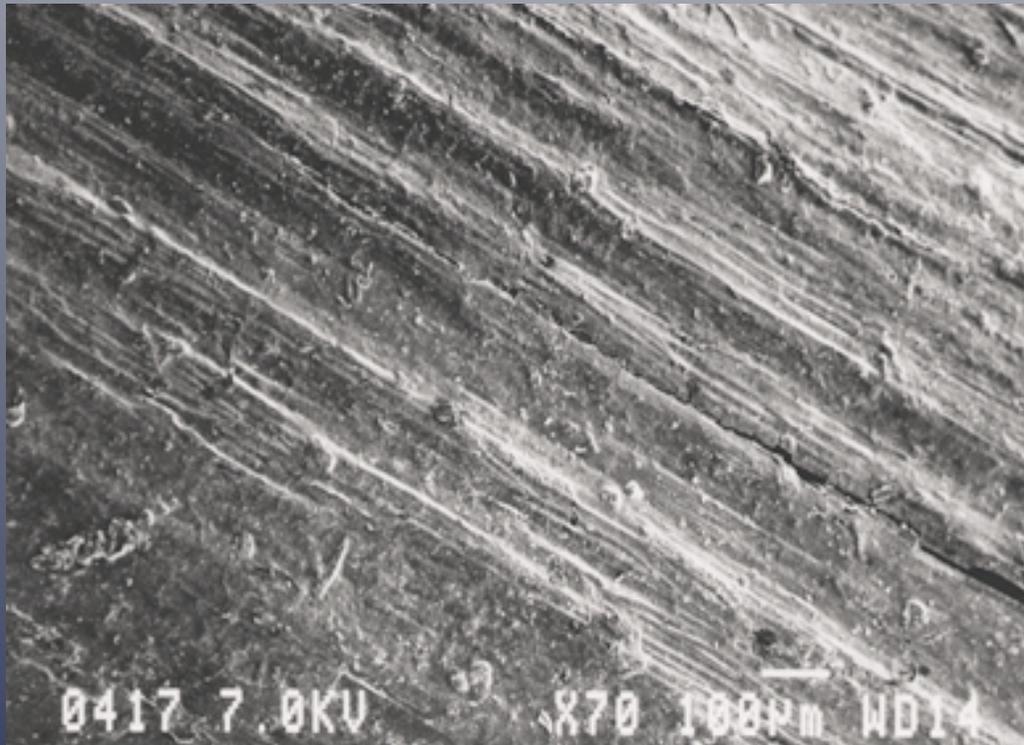
Polypropylène
+ fibres
prétraitées

Ciment à base de chènevotte



Bois de chanvre
(chènevotte)

Ciment à base de chènevotte



Chènevotte pétrifiée
par enrobage
de silicate de soude

Applications

