

Different nano cellulose absorption properties for super absorbent in hygienic applications

By:

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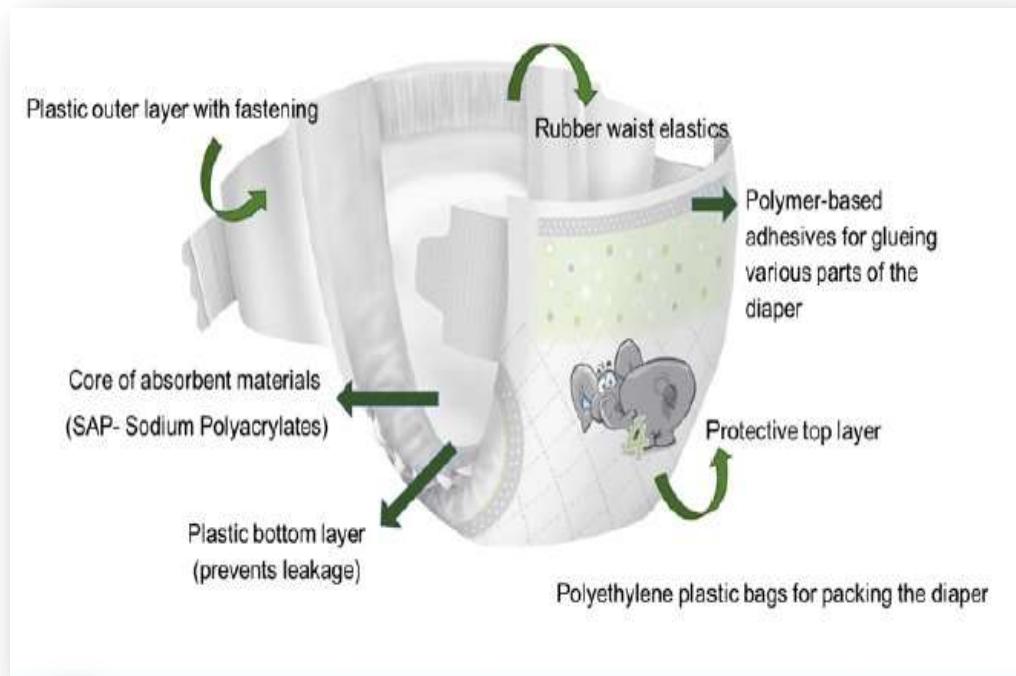
Supervisors:

Dr. Mehdi Jonoobi & Dr. Serena Danti

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under grant agreement No 837863. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium.

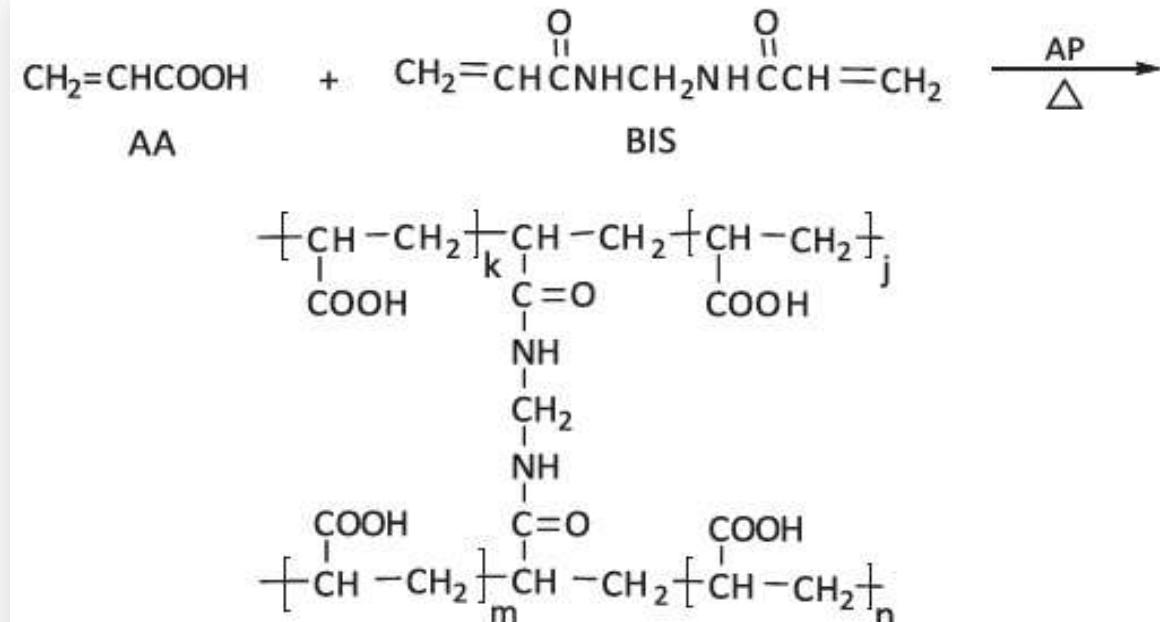


Baby Diaper



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Aishwariya and Priyanka, 2020



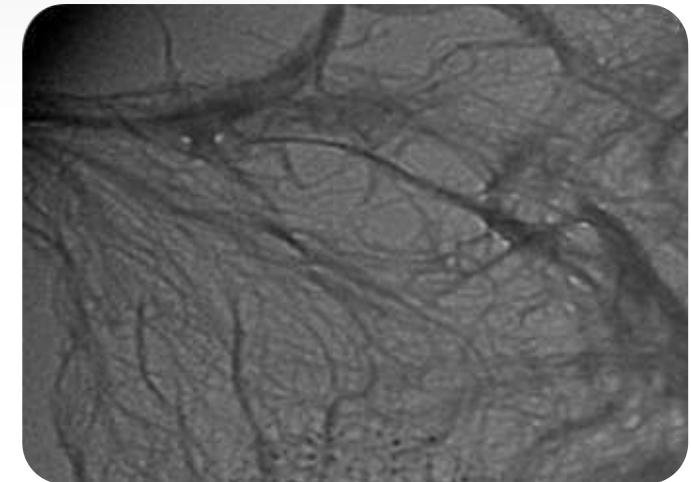
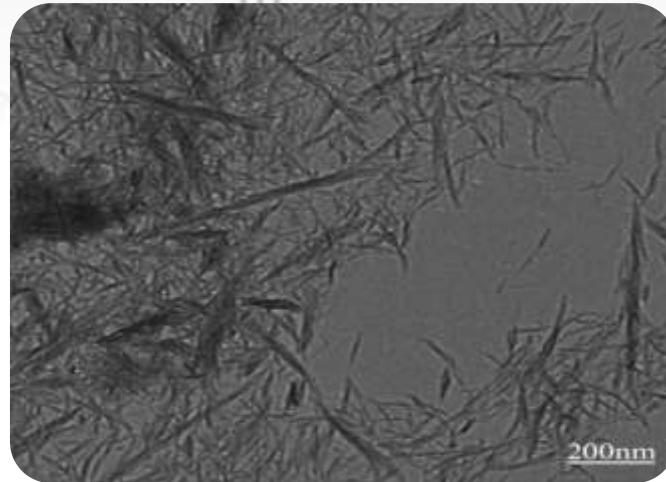
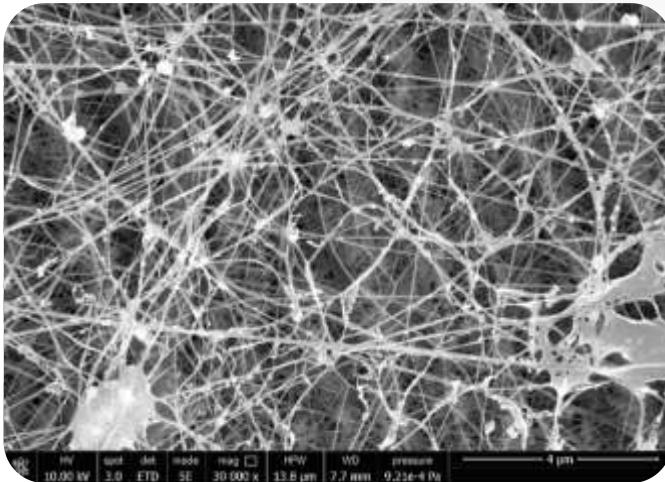
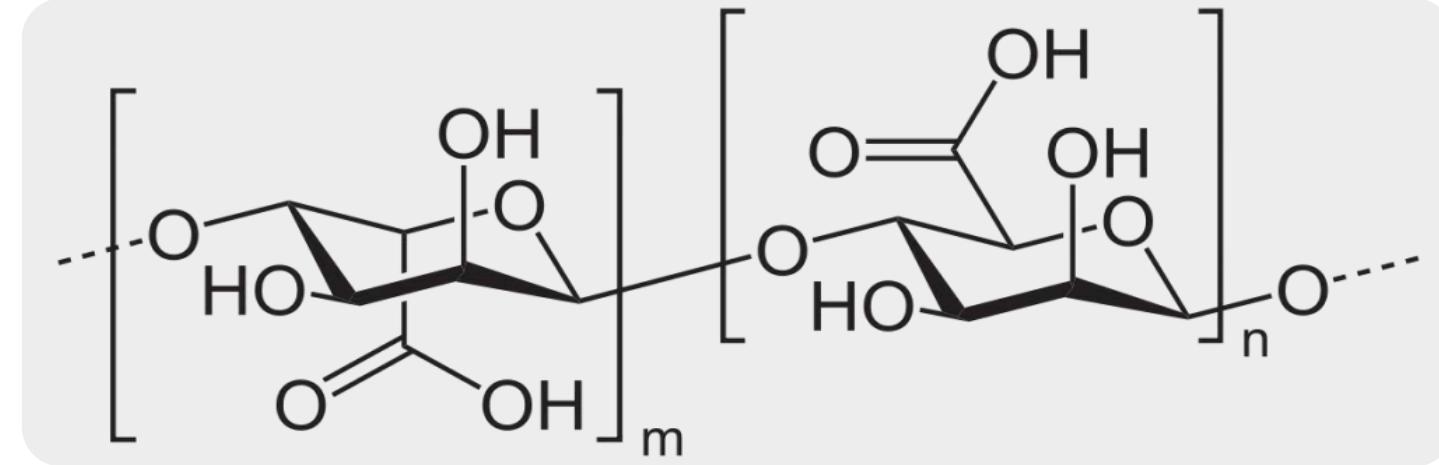
Acrylic based SAP (non-bio based)



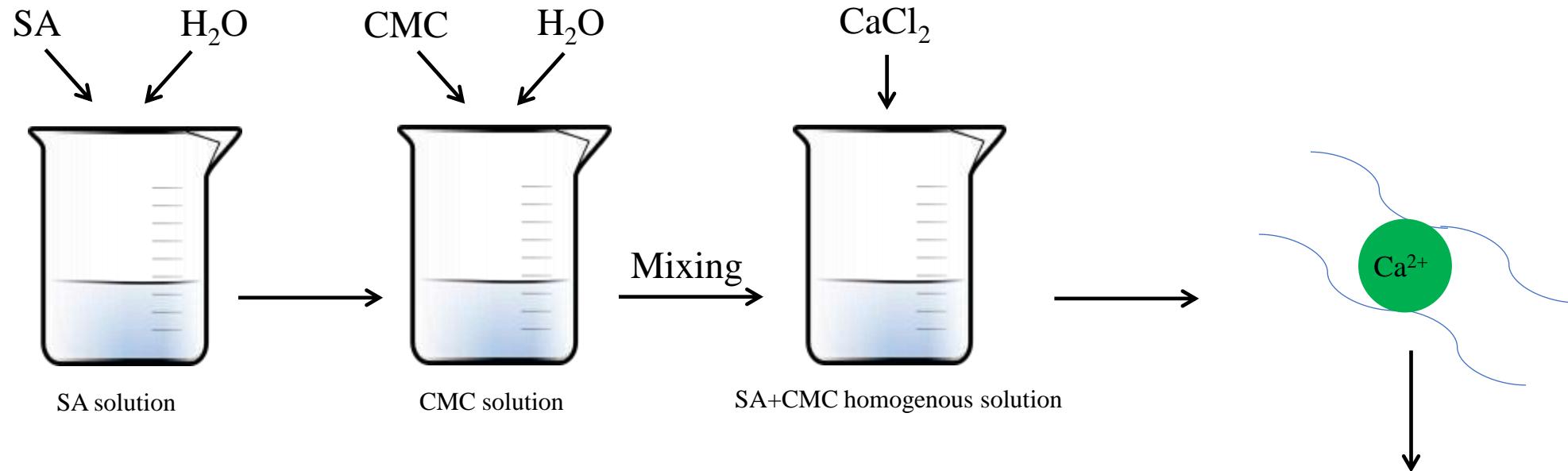
- Appropriate absorption capacity (60 g/g)
 - Low final cost
 - Good retention capacity (40 g/g)
 - Non-bio based



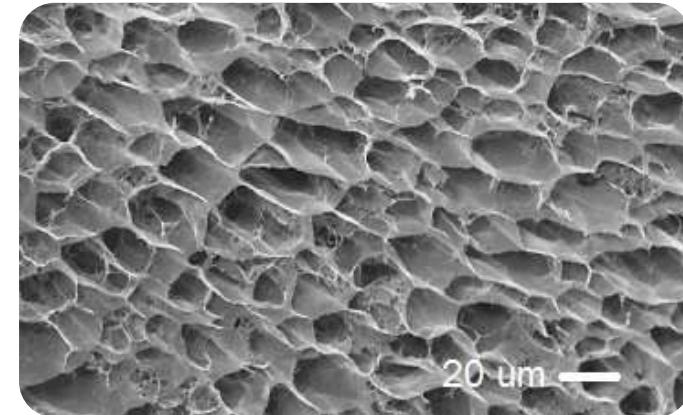
Poly saccharides (Sodium alginate & nano cellulose)



Bio-based Superabsorbent polymers



- Appropriate absorption capacity (70 g/g)
- Full bio-based
- Poor retention capacity (35 g/g)



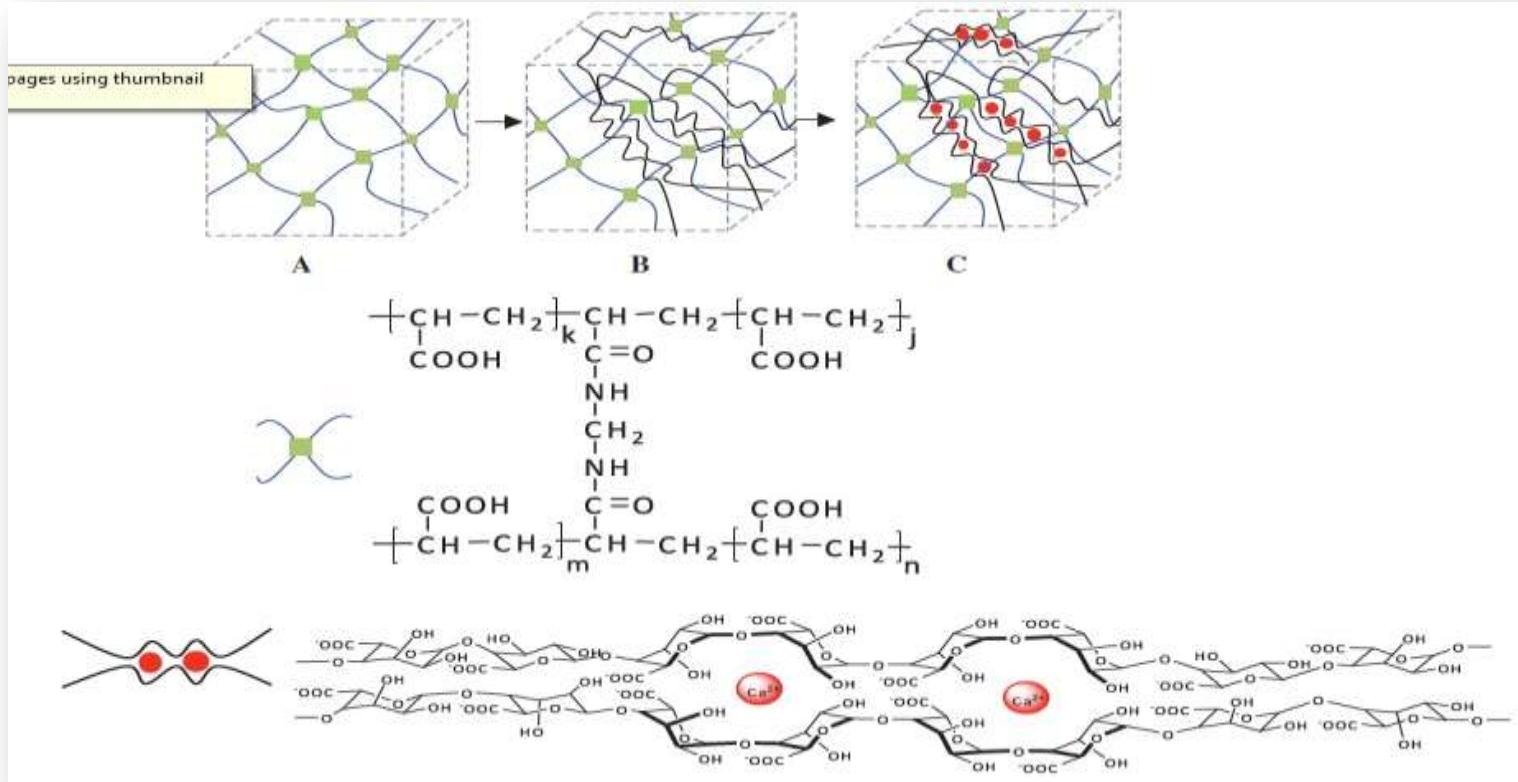
(Full bio-based)



Wu et al., 2015

Graft co-polymerization

1st CONFERENCE ON
GREEN CHEMISTRY &
SUSTAINABLE COATINGS



Graft co-polymerization (semi-bio based)

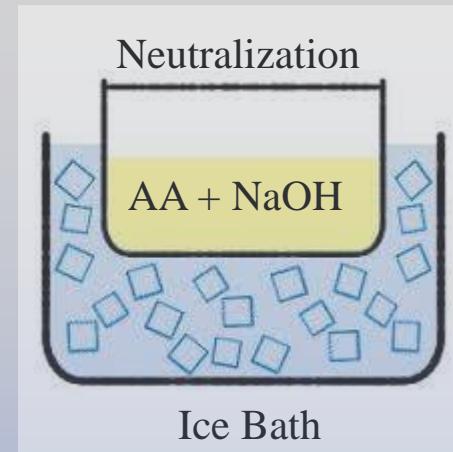


- Very high absorption capacity (120 g/g)
- Very good retention capacity (70 g/g)
- Appropriate cost
- Semi-bio based

Materials and methods

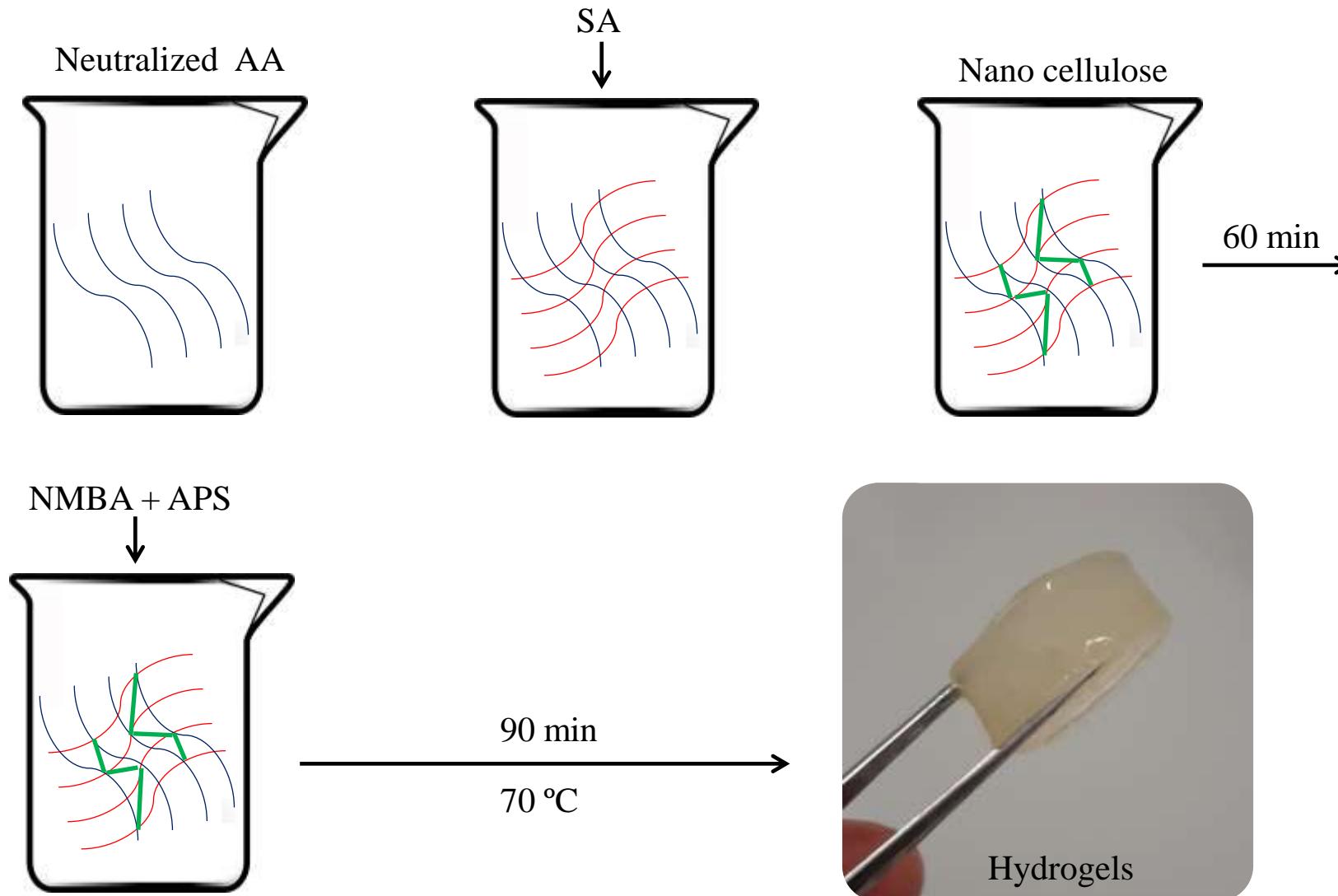


- Acrylic acid (AA)
- Sodium hydroxide (NaOH)
- Ammonium per sulfate (APS)
- *N-N* Methylene bis acryl amid (NMBA)
- Sodium alginate (SA)
- Nano cellulose (CNC, CNF, BNC)
- Sodium chloride (NaCl)



Graft co-polymerization

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Measurements

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$$FSC = \frac{mt - mo}{mo}$$



$$WR = \frac{mt}{m_0} \times 100$$



$$\frac{Mt}{Msat} = Kt^n$$



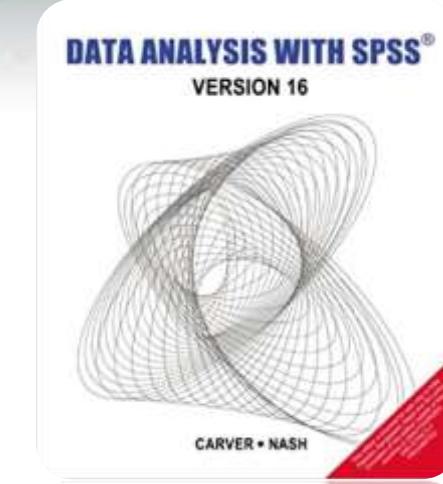
$$\log \left\{ \frac{Mt}{Msat} \right\} = \log(K) + n \log(t)$$



$$\frac{Mt}{Msat} = \frac{4}{L} \left\{ \frac{D}{\pi} \right\}^{0.5} t^{0.5}$$



$$GF = \frac{ma}{mo} \times 100$$

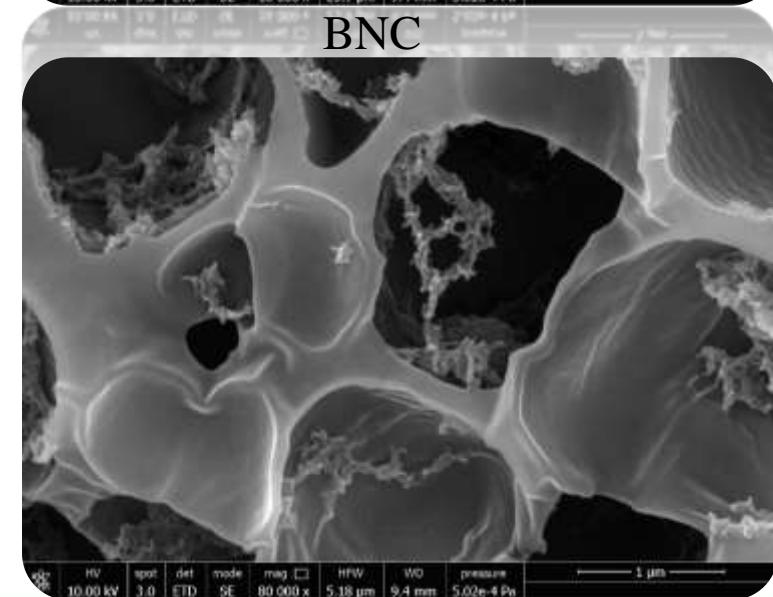
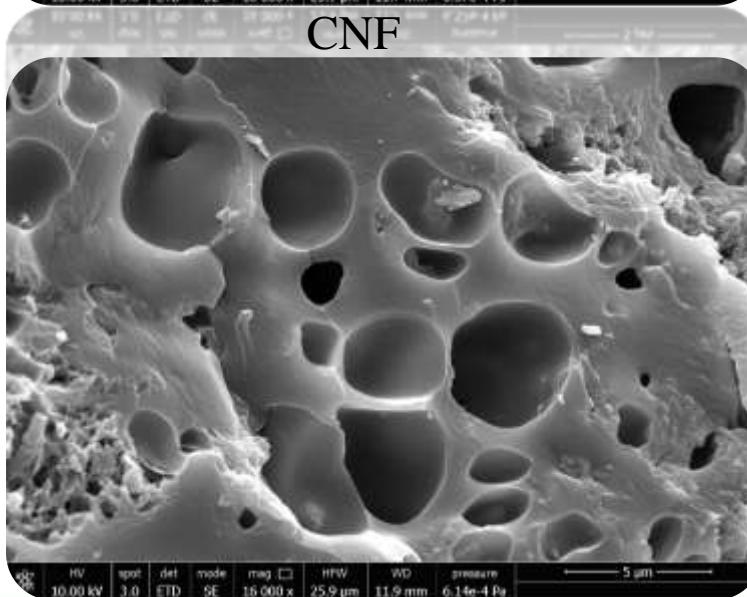
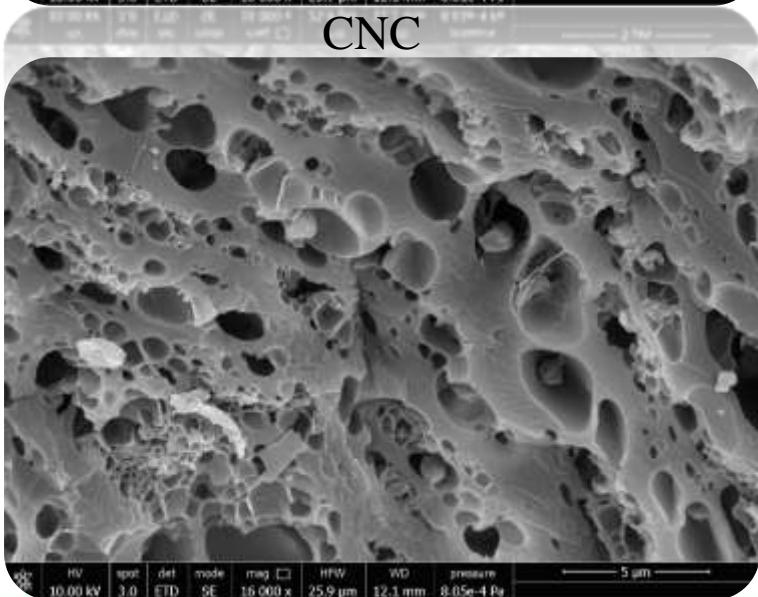
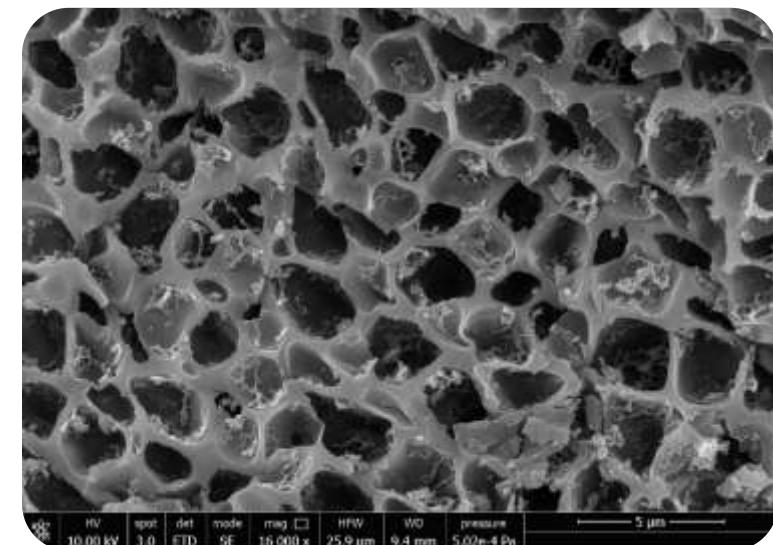
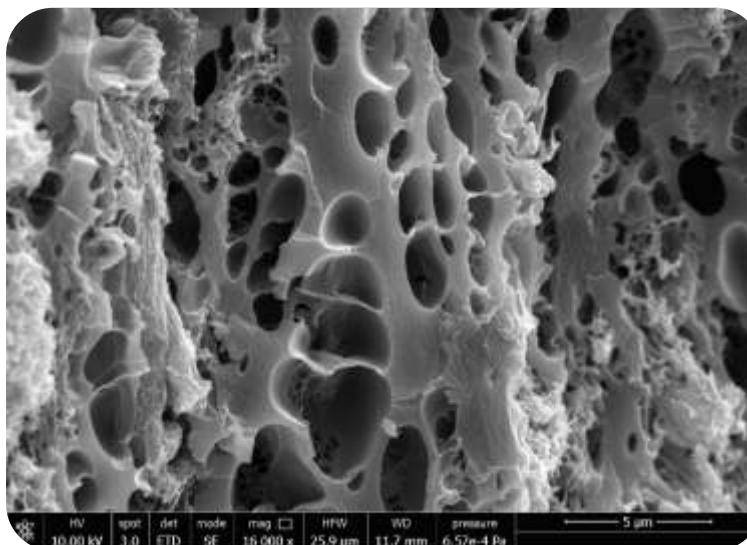
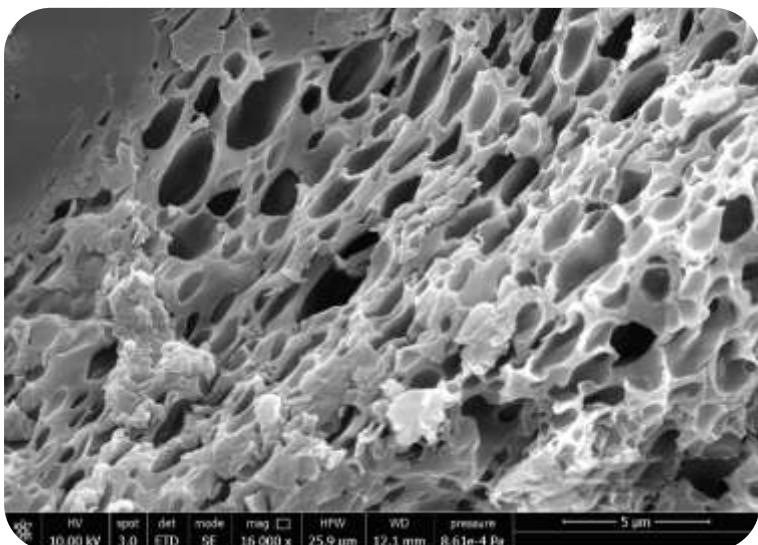


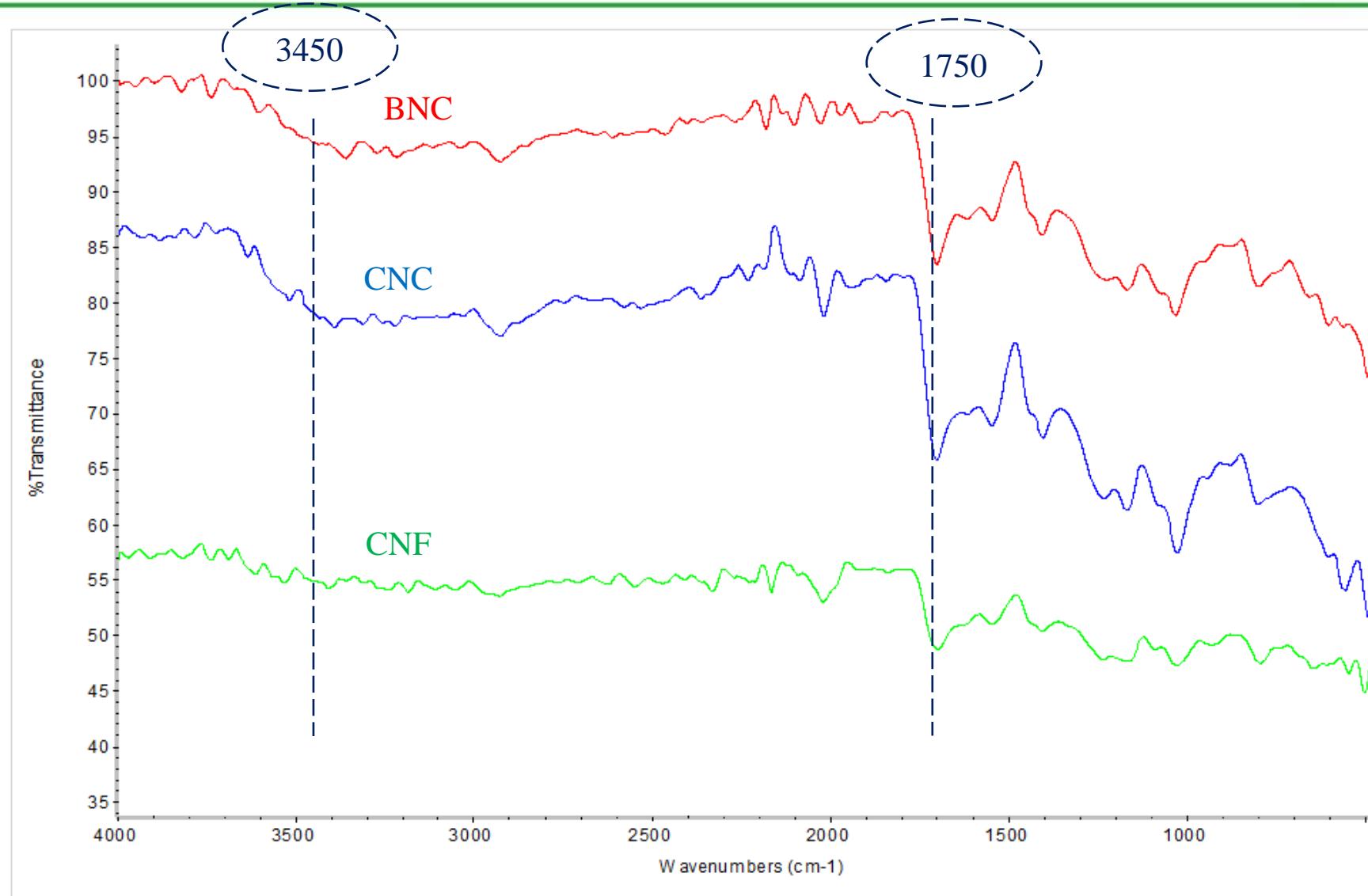


Formulations of super absorbent polymers

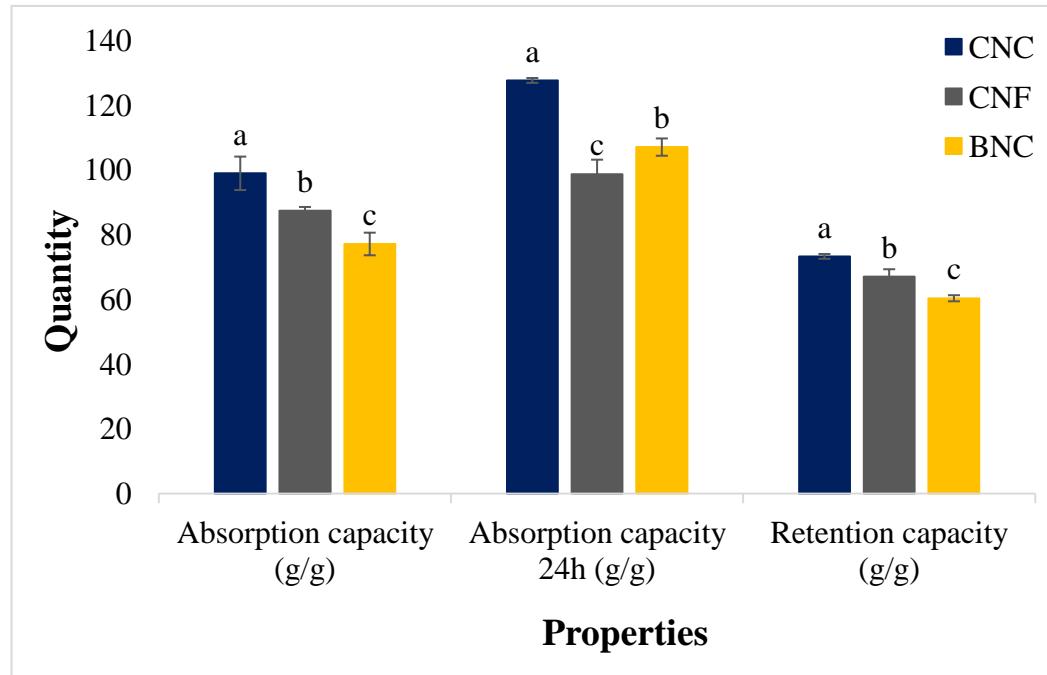
Formulations	AA (%)	NaOH (%)	APS (%)	NMBA (%)	SA (%)	Nano cellulose (%)	Solid content (%)
AA/SA/CNC	63	6.3	3.465	0.252	25.2	1.8	20
AA/SA/CNF	63	6.3	3.465	0.252	25.2	1.8	20
AA/SA/BNC	63	6.3	3.465	0.252	25.2	1.8	20

SEM photography

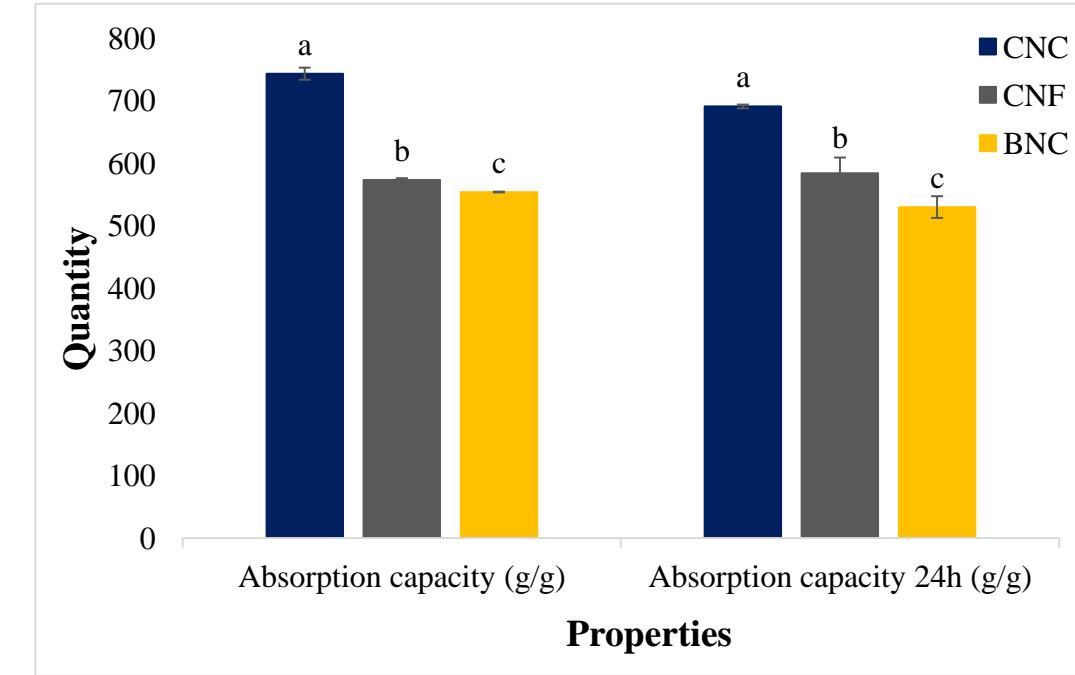




Results

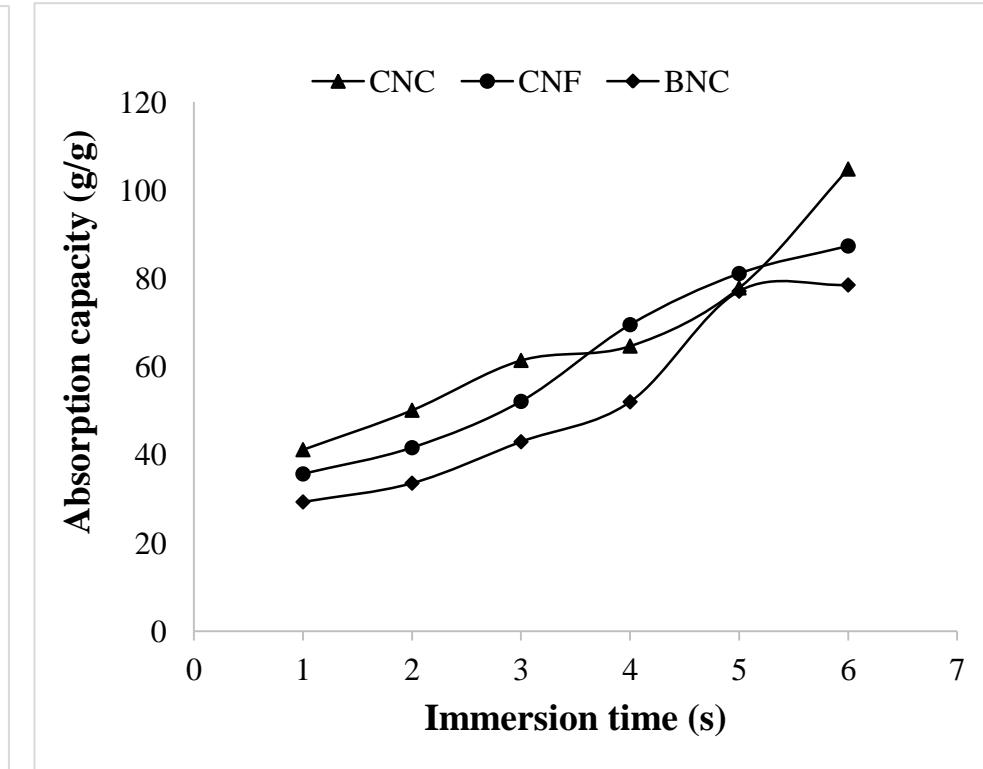
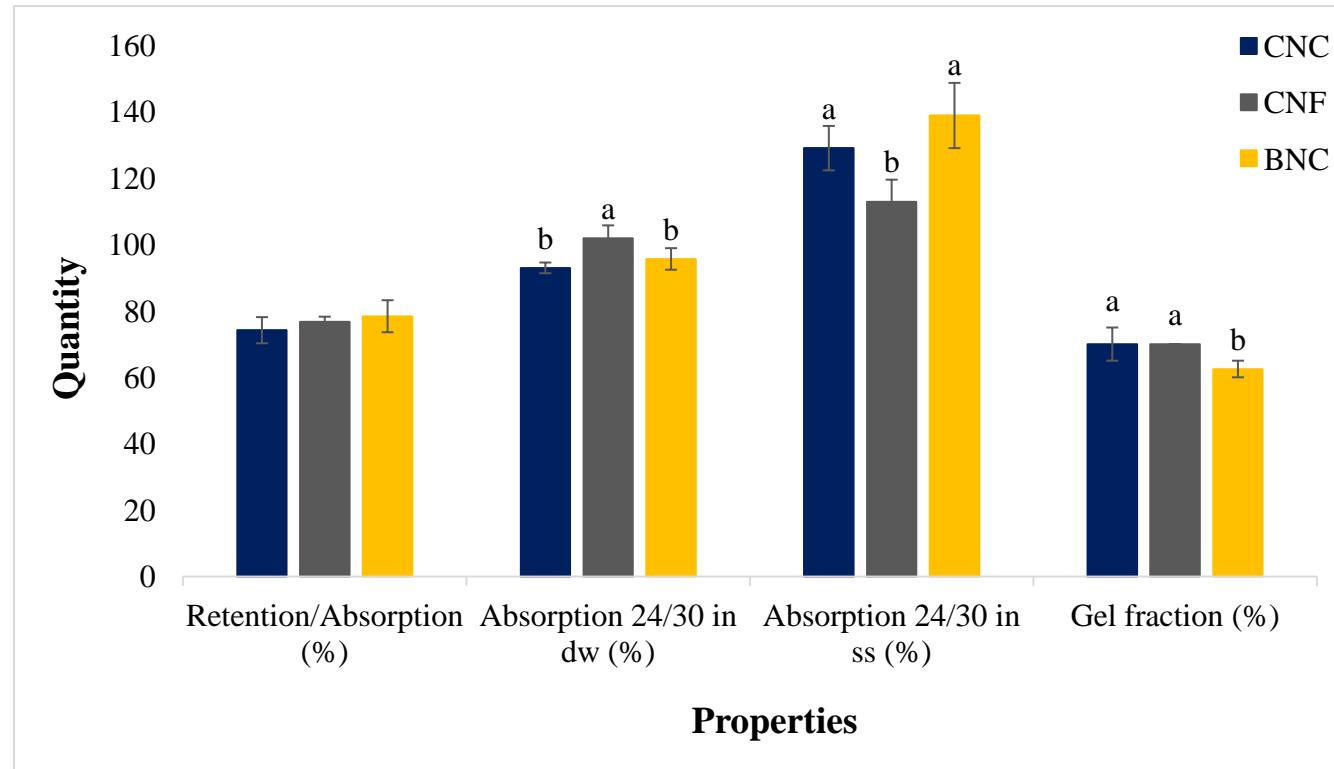


Absorption and Retention capacity in saline solution

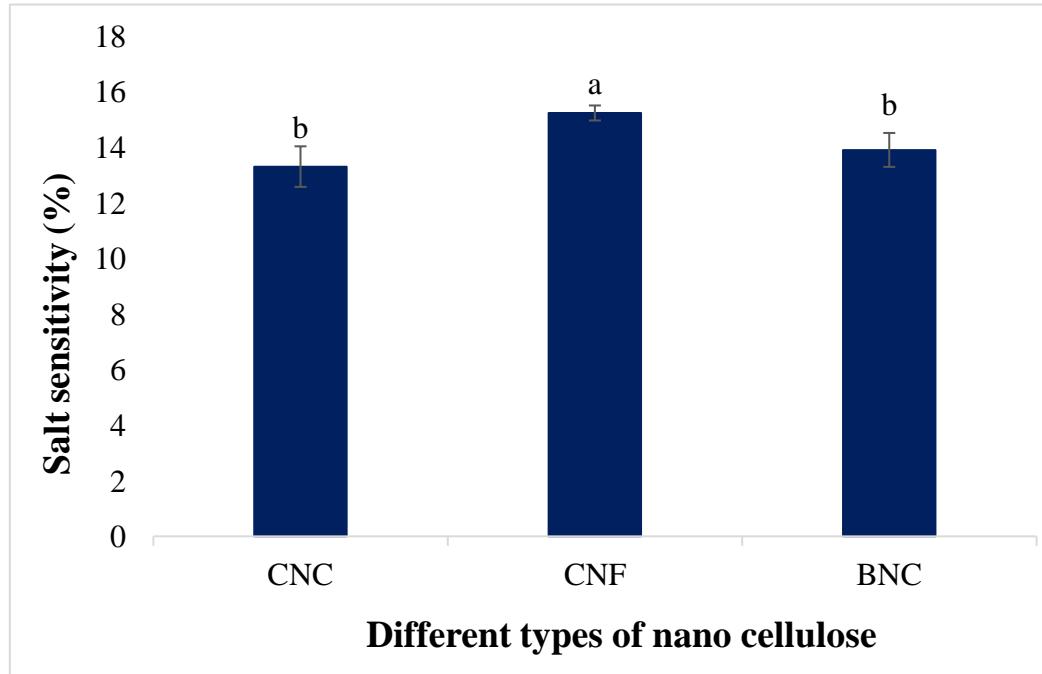


Absorption capacity in distilled water

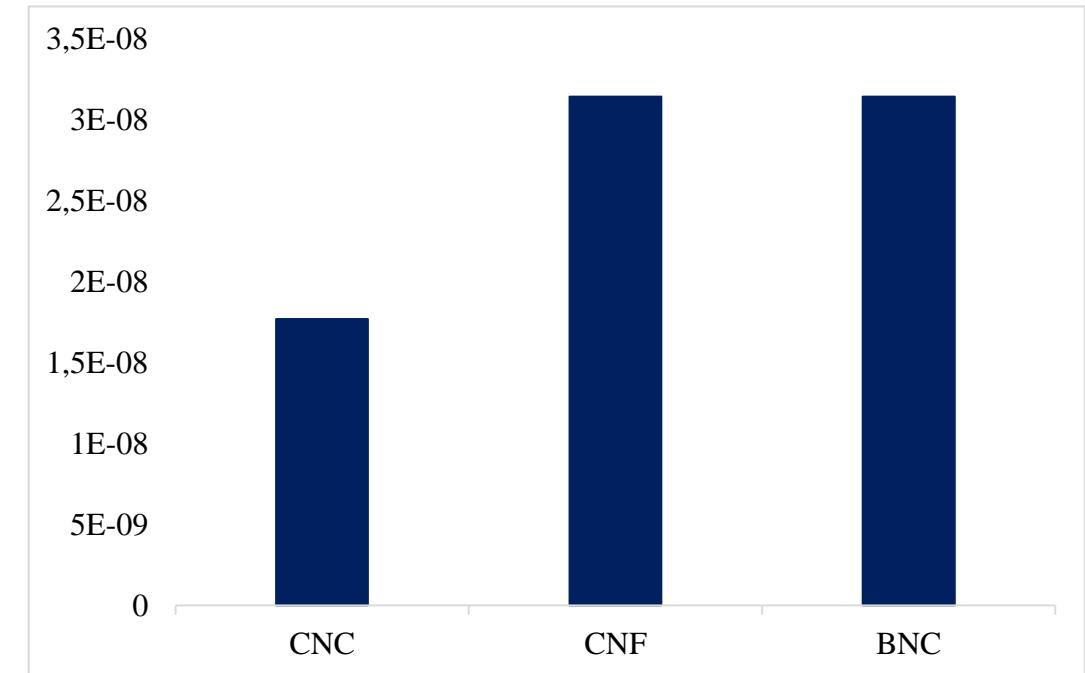
Absorption Kinetic







Salt sensitivity



Water diffusion efficiency



Thank you for your attention

