



Synthèse et caractérisation de nanoparticules biohybrides multicouches



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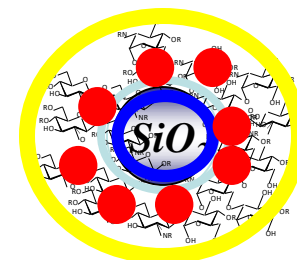
UMR7312/ICMR CNRS Reims

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- Introduction / Sol Gel
- Formation des Nanoparticules Hybrides
- Formation des Nanoparticules Bio-Hybrides BHNP
 Modèle Ac. Amin.
 Sucres, Polysaccharides modifiés NH₂
- Formation des Glyco-Nanoparticules Bio-Hybrides BHNP
- Réactivité
- Caractérisation des oxyranes résiduels
- Fonctionnalisation secondaire
 Glyco Bio-Hybrides Multicouches MBHN
- Perspectives



Sol Gel

Techniques sol-gel

Peu énergivore

Milieux aqueux

Réaction à température ambiante

Compatible avec substrats biologiques sensibles

Fonctionnalisation Organique

Large gamme de fonctionnalités organiques incorporables

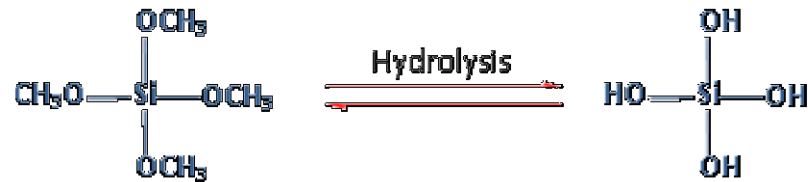
Pas de température élevées / modification

Matériaux hybrides

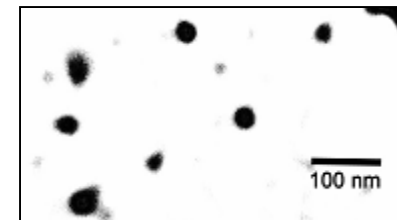
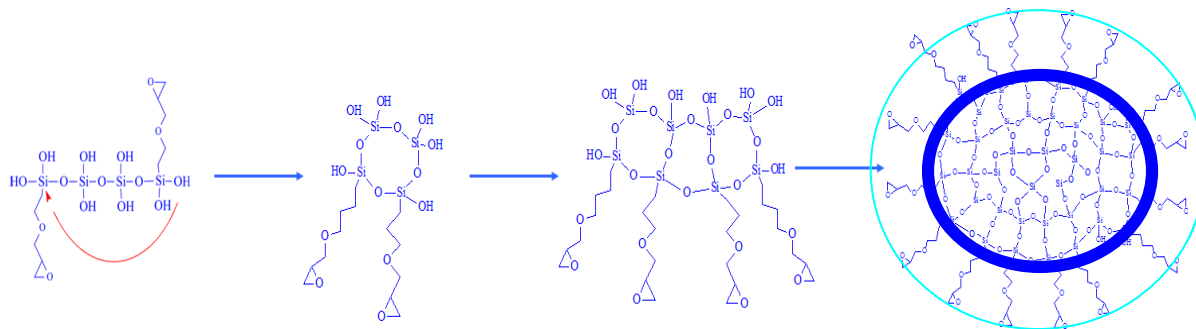
Gels Siloxanes polysaccharidiques

Formation des Nanoparticules Hybrides HNP

TMOS, T
Tetramethoxysilane



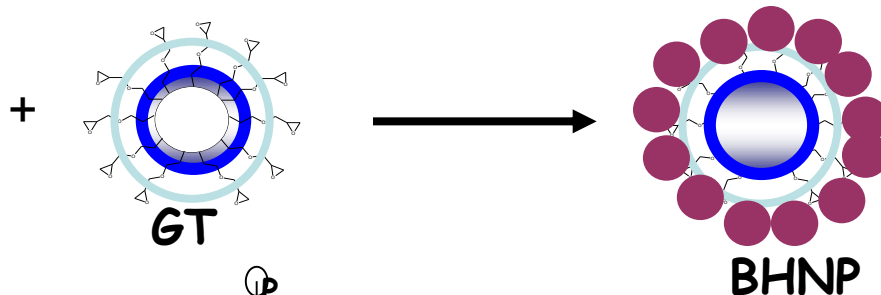
GPTMS, G
(3-**G**lycidyloxypropyl)
trimethoxysilane



HNP GT



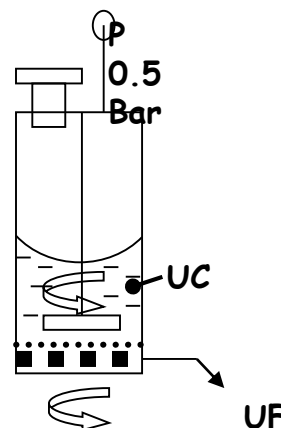
Formation des Nanoparticules Bio-Hybrides BHNP



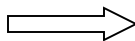
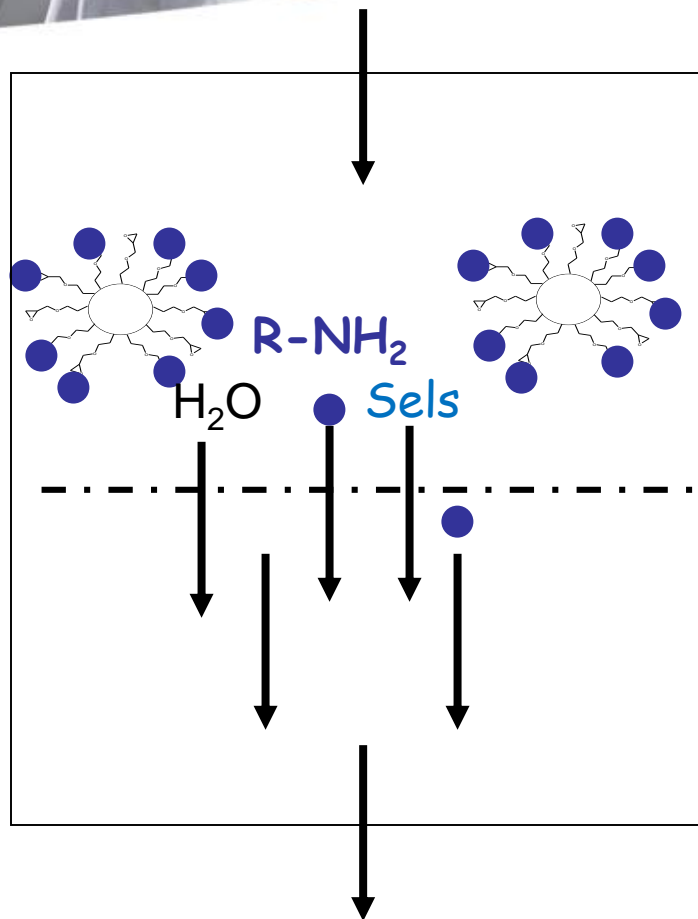
Modèle Ac Aminés : (Val, Pro)

Purification / Ultrafiltration - diafiltration

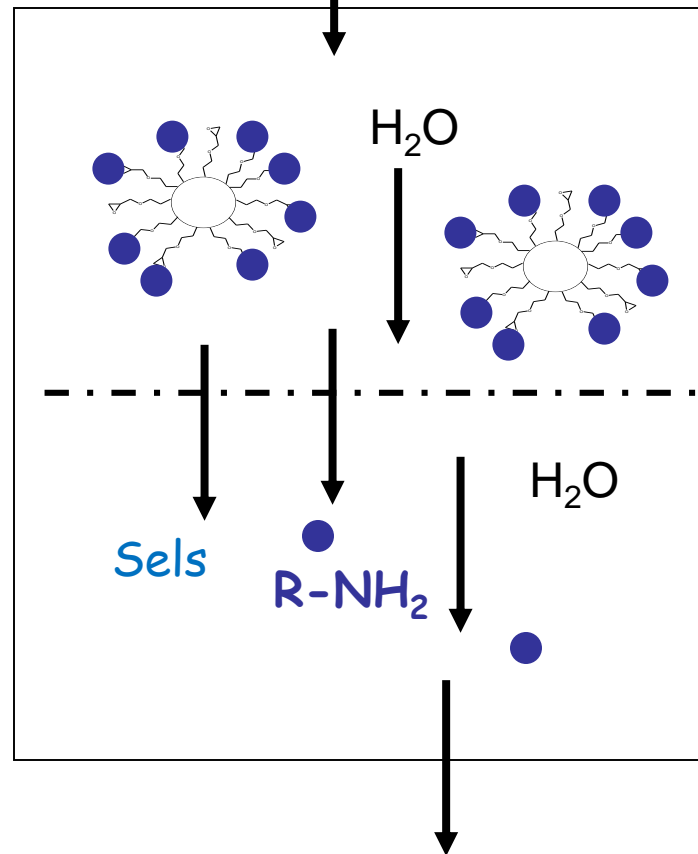
- Ultra filtration frontale agitée
- Membrane Cellul.
- MWCO 10 KDa



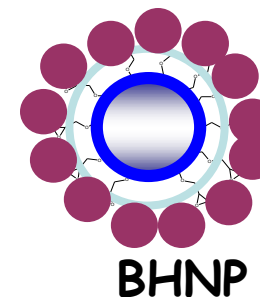
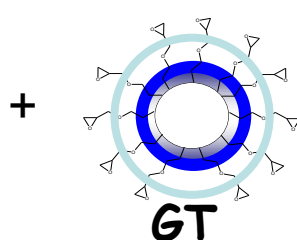
Purification des BHNP Ultrafiltration/ Diafiltration



10KDa



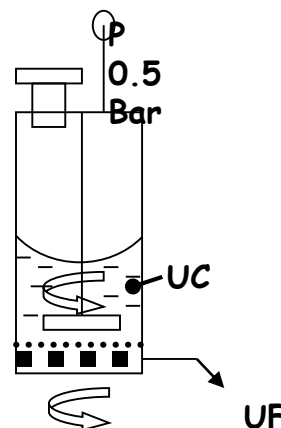
Formation des Nanoparticules Bio-Hybrides BHNP



Modèle Ac Aminés : (Val, Pro)

Purification / Ultrafiltration - diafiltration

- Ultra filtration frontale agitée
- Membrane Cellul.
- MWCO 10 KDa



Analyse

RMN / D₂O
Anal. Elém. N
Polarim. (-)

Nanosizer

Diamètre int.
(nm)

GT : Dia - nombre 3nm (→ 20 kDa)
- intensité 8nm (→ 70 kDa)

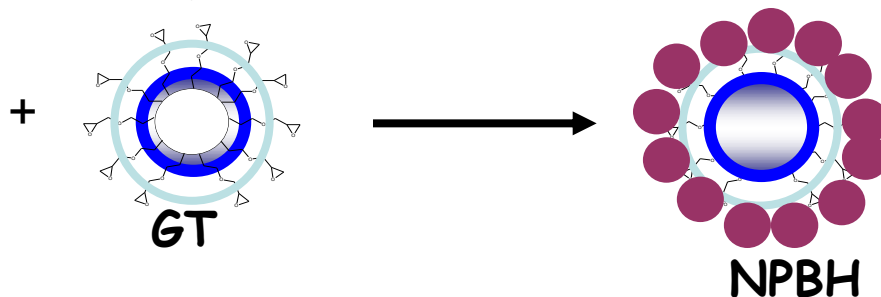
GT
Val
Pro

8,7
26,9
61,95

Formation des Glyco Nanoparticules Bio-Hybrides BHNH

Sucres

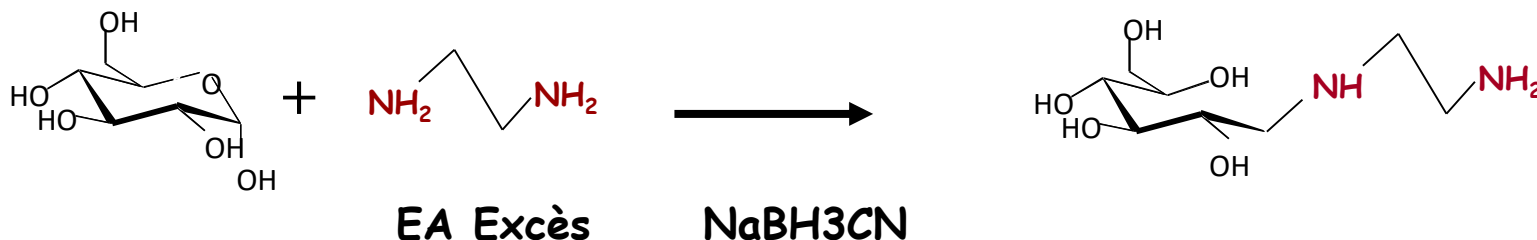
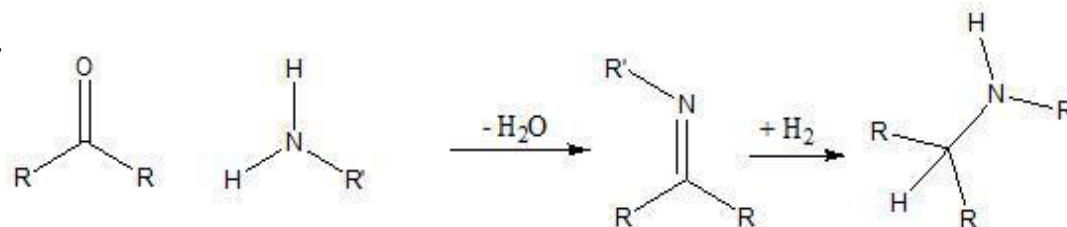
RNH_2



Synthèse Sucres modifiés NH_2

Amination réductrice

- H_2O
- SN / GT



Glucose (Galactose)

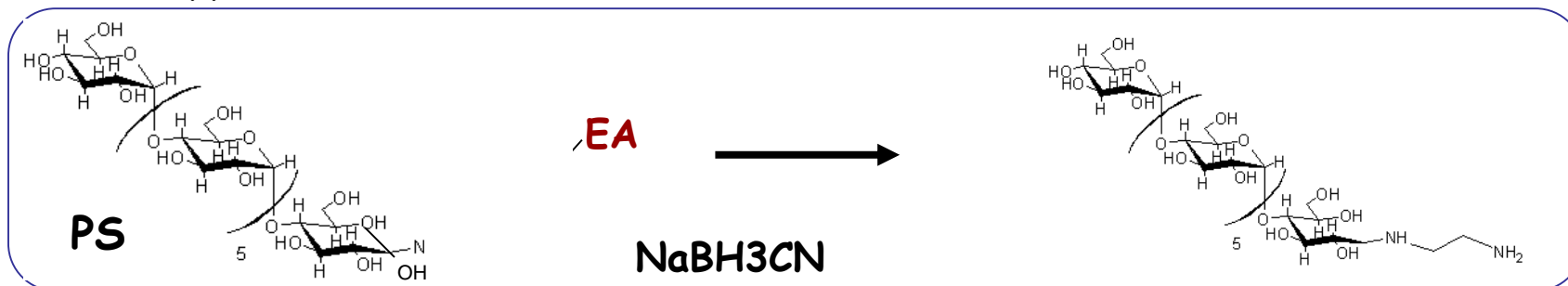
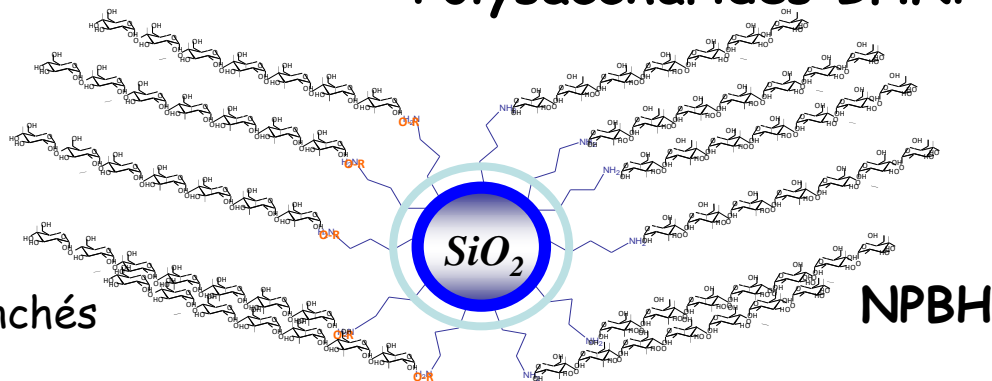


Formation des Nanoparticules Bio-Hybrides Polysaccharides BHPN

Oligo- Polysaccharides modifiés NH₂

Décoration, protection, furtivité...

- Modèles - de Macro dendrimères
 - de polymères hyperbranchés
 - pptés visco.



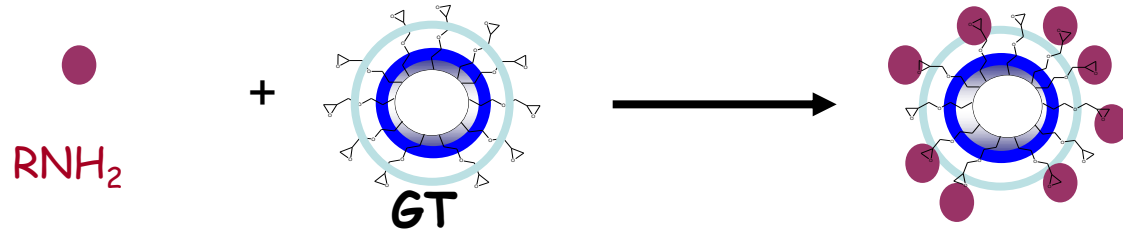
Maltose, Lactose, Cellobiose (DP2)
 Oligo : Dextrine G-19 (DP7)
 Polysacch.: Dext lim. (DP 30)
 Dextrane 10 KDa (DP 50)

Purif. GPC / UF (CuSO₄)
 Caract. G19 G19EA EA
 RMN
 SM
 Anal. Elém. (N)

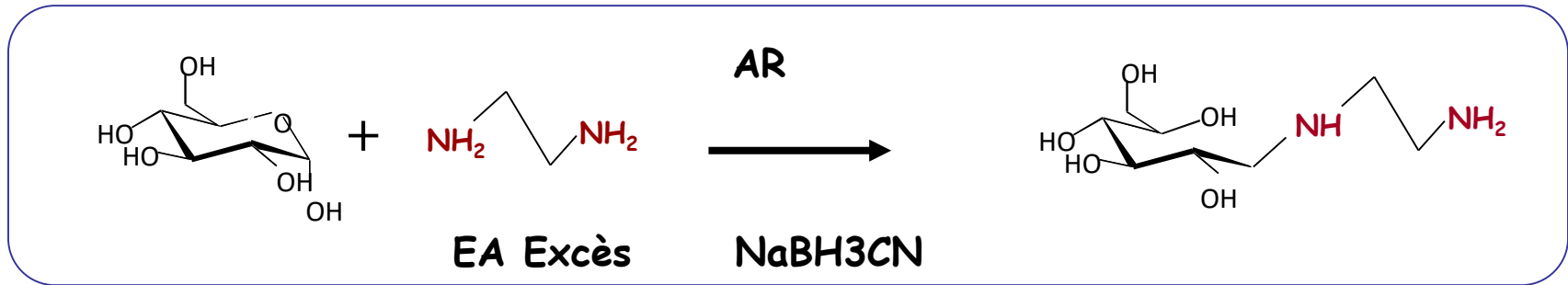




Réactivité des Glyco Nanoparticules Bio-Hybrides BHNP



Sucres modifiés



Le greffage Glc-EA sur GT \rightarrow BHNP pas stables

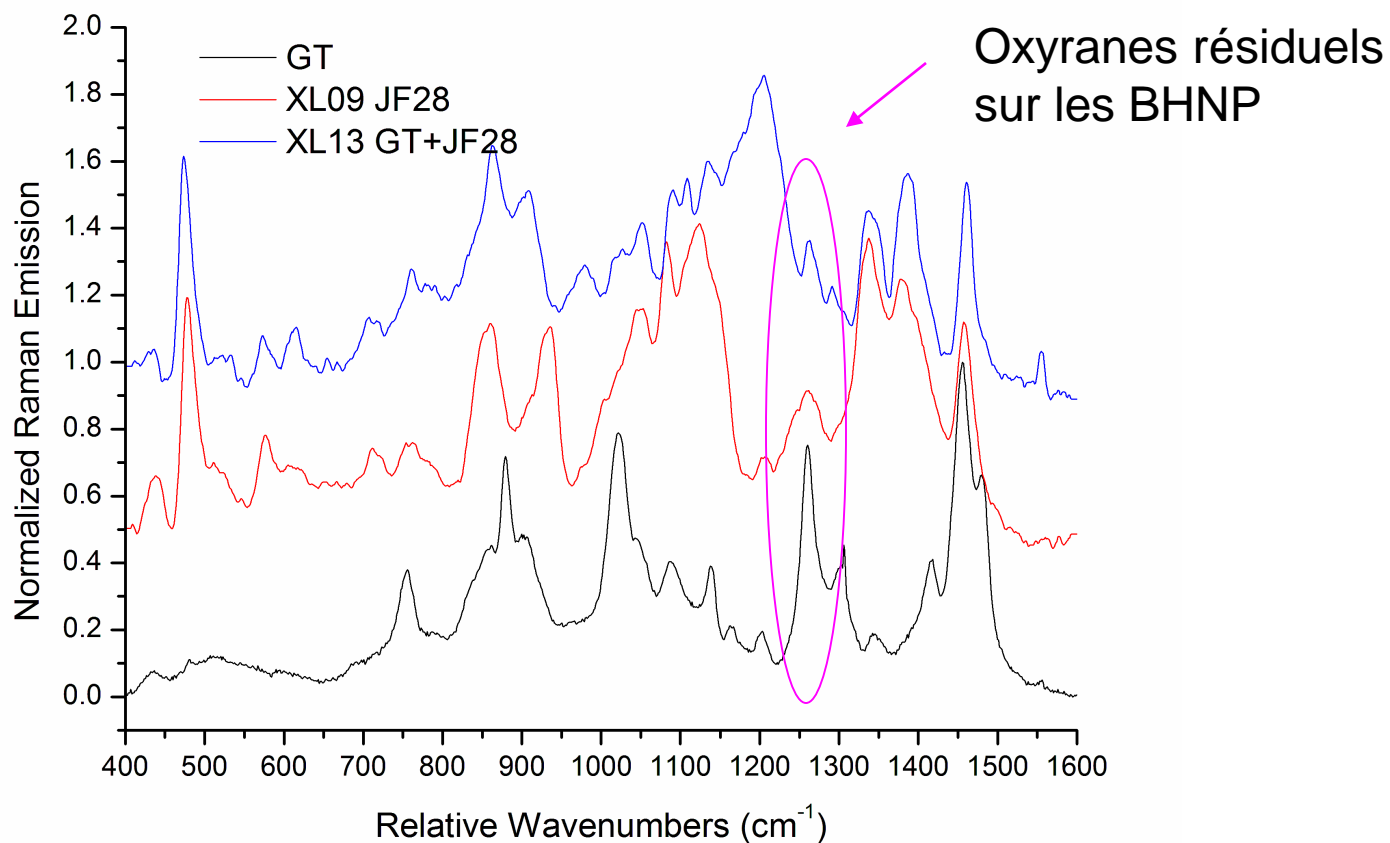
Réticulation des NPHB modifiées \rightarrow gel

Réactivité des groupes oxyranes libres restants ?

PS BHNP Stables



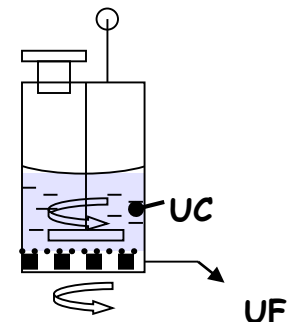
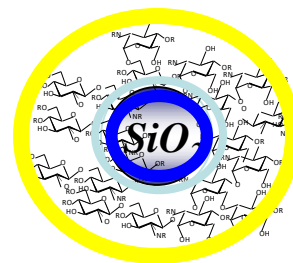
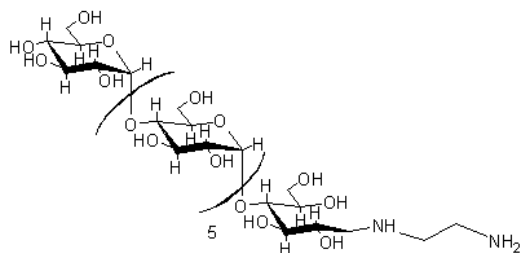
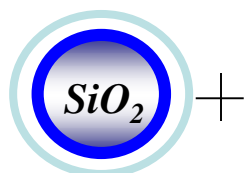
Caractérisation des oxyranes résiduels des BHNP





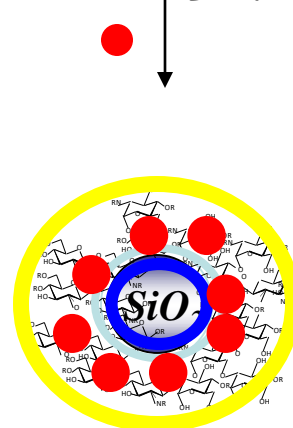
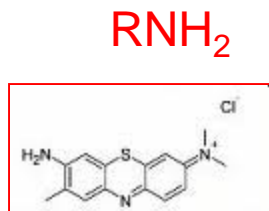
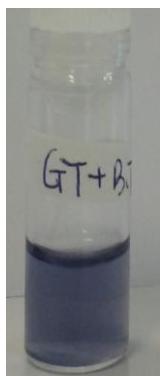
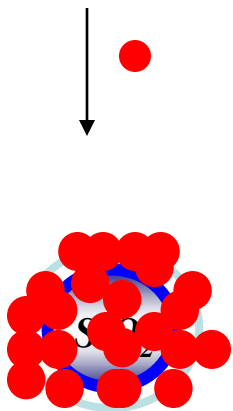
Fonctionalisation secondaire

Les Glyco Nanoparticules Bio-Hybrides Multicouches MBHN



GT

BHNP



GT (11 10⁻⁴ Mol/L)

MBHN

(2,2 10⁻⁴ Mol/L)

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Perspectives

Etudes :

Dégradabilité Enzymatique (PS de surface)

Modèles de vectorisation / transport

Activité biologiques

Furtivité

Hydrosolubilisation - protection

Ptés physicochimiques :

Modèles de polysacch. hyperbranchés

Macro dendrimères

pptés visco

structure amorce (biosynthèse amidon)

...



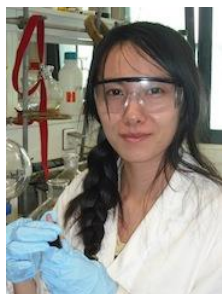
Merci à :



Maria Carrero Jurado



Andrew Vreugdenhil



Lu Xu





Merci de votre attention





advancing the frontiers

