Supporting Information

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Glossary

PS: polysaccharide
MO: metal oxide
MMO: mixed metal oxide
NP: nanoparticles
MM&SC : mastering morphology and size control
TTIP: $Ti(O^iPr)_4$
TTB :$Ti(OBu)_4$
SSA: specific surface area
NP: nanoparticles
TEOS : $Si(OEt)_4$
TMOS : $Si(OMe)_4$

Table 1- MO@cellulose (Part 1 : Controlled growth of metal oxide nanoparticles)			
Support	**Metal oxide**	**NP ∅ (nm) /SSA ($m^2 g^{-1}$)**	**Potential applications [Ref.]**
Cotton linter pulp in NaOH–thiourea–urea solution	Co_3O_4	5-20 / -	Material for Li-ion battery electrodes[1]
Cotton cellulose	CeO_2	40-120 /	Material for UV protection[2]
Bacterial cellulose	Fe_2O_3	10-30 / -	Material for immunoselective absorption[3-5]
Bacterial cellulose Acetobacter xylinum Gluconacetobacter xylinus	Fe_3O_4	10-30 / -	Electromagnetic absorbing materials[6]
		10-15 / -	Material for flexible magnetic membranes[7]
		<50 / -	Membrane for As(V) removal[8]
		80-200 / -	Flexible amphiphobic and magnetic membrane[9]
Microcristalline cellulose in NaOH/urea solution		5-100 / -	MM&SC[10]
Cotton linter pulp		5-20 / 60-180	Electrochemical and Magnetic material[11,12,13,14,15-17]
Medical cotton in NaOH–thiourea–urea solution		60 / 113	Absorbent for As(III) and As(V) removal[18]
Cellulose nanocrystal	Ga_2O_3	10-50 / -	M&SC[19]
Cotton wool	HfO_2	5-10 / -	MM&SC and High-K metal oxide[20, 21]
Cellulose	Mn_3O_4	100 / -	Absorbent for Cr(VI) removal[22]
Hydroxypropyl cellulose	Nb_2O_5	<100 / -	Material for solar energy conversion[23]
Suspension of microcrystalline cellulose powder	NiO	100-60 / -	MM&SC[24]
Cellulose nanocrystal from cotton wool	SiO_2	- / 300-500	Hierarchical SBA15-porous silica[25]
Cotton cellulose pulp in LiCl/DMAC.solution	SnO_2	<50 / -	Composite with electrical conductivity[26, 27]
Hydroxypropyl cellulose)	TiO_2	10-200 / -	MM&SC + mechanical properties[28]
Wood cellulose fibres (*Eucalyptus globulus*),	V_2O_5	50-200 / -	Improved opacity of paper fibers[29]
Colloidal solution of nanocrystalline cellulose		< 200 / -	MM&SC and high-K metal oxide[30]
cotton wool		5-10 / -	MM&SC and high-K metal oxide[20, 21]
Colloidal solution of nanocrystalline cellulose		50 / -	MM&SC[31]
Lint-free cellulose paper		20-50 /	MM&SC[32]
Colloidal solution of nanocrystalline cellulose	ZnO	- / -	Fluorescent material[33]
Freeze-dried bacterial cellulose membrane		50-100 / 50-100	Photocatalysis[34]
Cotton cellulose pulp		100-300 / -	MM&SC[35]
Cellulose nanocrystals from filter paper		5-20 / -	Antibacterial support[36]
Delignified sugarcane bagasse	ZrO_2	50-150 / 36	MM&SC[37]

Table 2-Mixed-MO@cellulose

(Part 1 : Controlled growth of metal oxide nanoparticles)

Support	**Metal oxide**	**NP ∅ (nm) /SSA ($m^2\ g^{-1}$)**	**Potential applications** **Ref.**
Cellulose powder	$Ba_3Si_6O_{12}N_2$: Eu^{2+}	- / -	Luminescent phosphore[38]
Wood cellulose fibres (*Eucalyptus globulus*)	$BiVO_4$	>500 / -	MM&SC[39]
Microcrystalline cellulose (Avicel)	$Bi_2\ Sr_2\ CaCu_2O_8$ $BiFeO_3$-Y(2%):	>100 / -	Superconductor[40]
Cotton linter pulp in lithium hydroxide/urea solution	$CoFe_2O_4$	15-50 / 200-300	MM&SC[41]
Nanocellulose fibers		10-40 / 23	Magnetic support for membrane[42]
Cellulose	$Co_{0.5}Cu_{0.5}Fe_2O_4$	16-42 / -	MM&SC[43]
Filter paper	$LiFePO_4$	35 / -	Material for Li-ion battery cathodes[44]
Cellulose powder	$LiAlO_2$:Mn^{2+}	- / -	Luminescent phosphor[45]
Microcrystalline cellulose (Avicel)	$Na_{0.5}K_{0.5}NbO_3$	>100 / -	Piezoelectric material[40]
Microcrystalline cellulose (Avicel)	$PrCoO_3$-Ni(29%):	>100	Ferromagnetic material[40]
Nanofibers from filter paper	SiO_2-Fe_2O_3	<100 / -	Super-paramagnetic composite[46]
Crystalline cellulose powder	$YBa_2Cu_3O_x$	- / -	Superconductor material[47, 48]
Microcrystalline cellulose (Avicel)	Y_2O_3:Eu^{3+}	>100 / -	Luminescent phosphor [40]
Hydroxypropyl cellulose		4-6 / -	[49]
Cellulose	$Y_{0.97}(P_{0.845}\cdot V_{0.455})O_4$: $Eu^{3+}{}_{0.03}$	10-15 / -	[50]
Lint-free cellulose paper	Y_2O_3:Eu^{3+}.	20-70 / -	[51]
Cellulose pulp	$(Y_{0.9}Eu_{0.1})(P_{0.6}V_{0.4})O_4$	10-70 / -	[52]
(Hydroxypropyl)methyl cellulose	V_2O_5, Y_2O_3 and YVO_4 et Eu-doped YVO_4	- / -	[53]
Microcrystalline cellulose (Avicel)	$Y_3\ Al_5O_{12}$-(Tb(1%)	>100 / -	[40]

Table 3- MO@Alginate (Part 1 : Controlled growth of metal oxide nanoparticles)			
Support	**Metal oxide**	**NP ∅ (nm) /SSA ($m^2 g^{-1}$)**	**Potential applications [Ref.]**
Sodium alginate	$Au@CeO_2$	5-6/ -	Photocatalysis[54]
	CeO_2 and $Au@CeO_2$	20-50/ -	MM&SC [55]
	CuO	25-100 /500	MM&SC and catalysis support [56, 57]
		200/ -	Photocatalysis[58]
	CuO + Mn_3O_4, and mixed phase	10-100/ -	MM&SC and catalysis for toluene oxidation[59]
	Co_3O_4	25-100/ 500	MM&SC and catalysis support [56, 57]
	Fe_2O_3	100/-	Material for magnetic resonance imaging[60]
	Fe_2O_3	5-30/-	MM&SC and highly magnetic composite[61]
	Fe_2O_3	- / -	Drug delivery and comparison with sodium alginate, bacterial cellulose, chitosan[62]
	Fe_3O_4	100/-	Material for magnetic resonance imaging[60]
	Mn_3O_4,	10-100/-	Catalysis for toluene oxidation[59]
	NiO,	25-100/500	MM&SC and catalysis support [56, 57]
	$Pb[Zr_xTi_{1-x}]O_3$	<50/-	Piezoelectric nanowire[63]
	SiO_2	< 100/-	MM&SC and comparison : chitosan κ, λ, and ι carrageenan[64-66]
	TiO_2	10-100/100-200	Morphology, size control and organic functionalization[67]
		--/130 - 187	Photocatalysis (+ $Au@TiO_2$)[68]
	WO_3	5-6/-	Photocatalysis[54]
	$YBa_2Cu_4O_8$	Fibrous particles	Superconducting material[69]
	ZrO_2	20-50/-	MM&SC[55]
Sodium and ammonium alginate	$La_{0.67}Sr_{0.33}MnO_3$	10-100/-	Superconducting material[70]

Table 4- MO@Chitosan or chitin (Part 1 : Controlled growth of metal oxide nanoparticles)			
Support	**Metal oxide**	**NP ∅(nm) / SSA (m^2 g^{-1})**	**Potential applications Ref.**
Chitosan	Al_2O_3	- / 465	Support for Ni-catalyzed processes[71]
Chitosan (90% deacetylation)	Al_2O_3	- / 100-450	Material for catalysis [72-74]
Chitosan (90% deacetylation)	SnO_2	- / 100-450	Material for catalysis support [72-74]
Chitosan (92.5% deacetylation	SiO_2	-/-	Enzyme carrier for glucose oxidase[75, 76]
Chitosan	SiO_2	-/-	Ph-sensitive membrane[77]
Chitosan (85% deacetylation)	SiO_2	-/-	Improved thermal and mechanical properties of composite[78]
High molecular chitosan	SiO_2	-/-	Support for chromatography[79]
Chitosan (90% deacetylation)	SiO_2	-/ 300-600	MM&SC and catalysis support [57, 80]
Chitin nanocrystal	SiO_2	/400-800	MM&SC[81]
Chitin nanocrystal	SiO_2	- /70-445	MM&SC[82, 83]
Chitosan (90% deacetylation)	SiO_2	- / 200-300	Luminescent material doped with Eu^{3+} [84]
Chitosan (90% deacetylation)	TiO_2	7-8 /200-300	MM&SC and catalysis support [74, 85]
Chitosan	TiO_2	- / 43	Comparison with furfural and saccharose Material for solar cells[86]
Chitosan	TiO_2		MM&SC and photocatalysis[87]
Chitin nanocrystal	TiO_2	- /70-445	MM&SC (+SiO_2-TiO_2)[82, 83]
Chitosan	WO_3	42 / --	Material for water-splitting[88]
Chitosan (85% deacetylation)	$YBa_2Cu_4O_8$	Nano-needles 500 x 10	High-*Tc* superconducting nanowires[89]
Chitosan (90% deacetylation)+ poly (vinyl alcohol)	ZnO	- / -	Material for antibacterial film[90]
Chitosan (90% deacetylation)	ZrO_2	- / 100-450	MM&SC and catalysis support[72-74]

Table 5 - MO@Starch, MO@Dextran, MO@Carrageenan, MO@Agarose (Part 1 : Controlled growth of metal oxide nanoparticles)			
Support	**Metal oxide**	**NP ∅ (nm) / SSA ($m^2\ g^{-1}$)**	**Potential applications [Ref.]**
Starch	TiO_2	25/72	Photocatalysis comparison with cyclodextrin and chitosan[87]
Starch		23/50-100	MM&SC and catalysis support[91]
Carboxylmethyl starch		-/-	Powder for electro-rheological fluids [92]
Potato starch	SiO_2	- / 50-200	Luminescent material and Cd(II) absorbent[93]
Starch amylose	SiO_2	100-200 / -	MM&SC and core-shell SiO_2@amylose NP[94]
Native starch modified with urea or thiourea	SiO_2	50-100 /200-300	Hybrid material for absorption of metal cations[95]
Potato starch in ionic liquid	ZnO	10-150/ -	MM&SC and comparison with cellulose[96]
Soluble starch in aqueous media	ZnO	10/-	MM&SC by seeding layer for ZnO nanorod growth[97]
		10/ -	MM&SC[98]
Dextran	Ag@CuO, Ag@TiO_2, Fe_3O_4	- / -	M&SC and magnetic sponges[99]
	Fe_2O_3; ZnO; CeO_2–CuO	10-100/ 10-20	M&SC and catalysis support[100]
	$YBa_2Cu_3O_7$	60 / -	Sponge-like superconducting material[101]
κ, λ, and ι Carrageenan	Fe_3O_4	5-15/-	MM&SC and catalysis support[102]
		10-20/ -	Contrasting agents for tomography[103]
	$Ni(OH)_2$ Co(OH)	-/ -	MM&SC[104]
	SiO_2	8-12/ -	Membrane for biocatalysis [105]
Agarose	ZrO_2-TiO_2	10-20/50-300	MM&SC and catalysis support[106]
	ZrO_2-TiO_2 Nb_2O_5, SnO_2	- /30-70	MM&SC[107]
	TiO_2	10-15/5-70	MM&SC and support for chromatography[108]
	TiO_2 and Au@TiO_2	10-30/260-60	Photocatalyst[109]
	Al_2O_3-TiO_2	10-15/50-200	Photocatalyst[110]

Table 6 - Biotemplating of cellulosic fibers to TiO_2@Cellulose and pure TiO_2 (Part 2 : Templating of polysaccharides fibers)			
Support	**Precursor /Process**	**SSA ($m^2 g^{-1}$)**	**Potential Applications** [Ref.]
Cotton fibers and wool	Impregnation with TTB sol	250-275	Photocatalysis[111]
	Impregnation with TTIP		Photocatalysis[112]
	Impregnation with TTB and ammonium ceric nitrate sol	250-260	Ce-doped TiO_2 Photocatalysis[113]
	Impregnation with TTB solution + direct calcination	5-10	Photocatalysis[114]
	Impregnation with $(NH_4)_2TiF_6$	50	Material for photoanode[115]
	Impregnation with $TiCl_4$ hexane solution	50	MM&SC[116]
	Impregnation with TiF_4 aqueous solution	50-70	Photocatalysis[117, 118]
Filter paper	TTB	-	Material for photocatalysis and elctrochemistry[119]
	Impregnation TTIP sol +Ag NP	35-65	Photocatalysis[120]
	Impregnation with TTB sol + flame calcination	10	MM&SC[121]
	Impregnation with TTB sol	400	Photocatalysis[122]
	ALD with $Ti(OMe)_4$	5-20	MM&SC[123, 124]
	Impregnation with TTB sol + Au NP	-	MM&SC[125 126]
Bacterial cellulose	Impregnation of TTB sol + Hydrothermal process (150°C) + urea addition Acetobacter xylinum	200-250	Photocatalysis[127]
	TTIP sol	-	Photocatalysis[128]
	Impregnation of TTB sol with Suzhou sweet wine koji bacterial cellulose	60	Photocatalysis[129]
Powdered cellulose	Impregnation of TBTand hydrolyzed in air sol	3-25	MM&SC[130]
Cellulose nanocrystals from filter paper	Tyzor-LA titanium lactate sol	170-200	MM&SC[131]
Regenerated cellulose	Impregnation of TTB sol	-	Photocatalysis[132]

Table 7 - Biotemplating of plants to TiO_2@Plant and pure TiO_2
(Part 2 : Templating of polysaccharides fibers)

Support	**Precursor / Process**	**SSA ($m^2 g^{-1}$)**	**Potential Applications** [Ref.]
Ramie fibers	Impregnation of TTB sol	<5	Photocatalysis[133]
Bamboo fibers	Impregnation of $TiCl_4$ sol	50-60	Photocatalysis[134]
Fern, jade, coralberry and ZZ plants	Impregnation of neat TTIP + Water vapour exposure	30-60	MM&SC[135]
Soft rushes	Impregnation of TTIP in 2-propanol	30-40	Photocatalysis[136]
Skin of tomatoes, onion bulbd, grapes, and garlic bulbs	Impregnation of TTIP in 2-propanol + water impregnation	60-70	Photocatalysis[137]
Linn leaves	Multi-step processing $TiCl_3$ aq. sol or TTB /acac EtOH sol	100	Photocatalysis[138]
Jute	$TiCl_4$ aq. sol	-	MM&SC[139, 140]
Cropt seeds	$TiCl_3$ aqueous solution	50-60	N–P-codoped TiO_2 Material for Photocatalysis[141]

Table 8 - Biotemplating of Cellulose to MO@Cellulose and pure MO (Part 2 : Templating of polysaccharides fibers)				
Support	**Metal oxide**	**Precursors / Process**	**SSA $m^2\ g^{-1}$**	**Potential Application Ref.**
Cotton wool	Al_2O_3	ALD processing $Al(CH_3)_3$	-	MM&SC[142]
Jute	Al_2O_3	Aq. sol. of $AlCl_3$	200-500	MM&SC[140]
Rattan *Calamus rotang*	Al_2O_3; Al_2O_3/ZnO	Al and Zn metal (CVD + oxidation)	-	Luminescent material[143]
Native cellulose of southern yellow pine	Al_2O_3–V_2O_5	ALD $Al(CH_3)_3]$ $VO(OC_3H_7)_3$	<5	V_2O_5/CNT/cellulose for electrodes[144]
Bacterial cellulose Gluconacetobacter xylinum	Fe_3O_4	Aq. Sol. of $FeCl_3$ and $FeCl_2$	NP ∅ 15nm	Adsorbents for metal ions[145]
Cotton figer	$LiCoO_2$ and $Li(NiMnCo)_{1/3}O_2$	Aq. Sol. Of $Li(NO_3)$ $Co(NO_3)_2$ $Ni(NO_3)_2$ $Mn(NO_3)_2$	NP ∅ 100-500nm	Material for Li-ion battery cathodes [146]
Filter paper	$LiMn_2O_4$	Aq. Sol. $Li(NO_3)$ $Mn(CH_3CO_2)_2$	–	[147]
Lens paper	MnO_2	$KMnO_4$ + Oleic acid	NP ∅ 50-200 nm	Catalyst for oxidation of formaldehyde[148]
Rice paper		$KMnO_4$	6-50	Materials for supercapacitor[149]
Paper	MoO_3	$(NH_4)_6(Mo_7O_{24})(H_2O)_4$	NP ∅200 nm	MM&SC [150]
Regenerated cellulose aerogel	SiO_2	TEOS	400-700	MM&SC[151]
Filter paper			600-800	MM&SC - Silica nanotube[152]
Ashless filter paper			NP ∅20-40nm	Material for anodes[153]
Cellulose nanorod				MM&SC - Silica nanotube and nanowire[154]
Cellulose nanorod suspension		TMOS	Mesoprous material	Hierachical porous silica[155]
Powdered cellulose		TEOS	10-100	[130]
Bacterial cellulose Gluconacetobacter xylinum	V_2O_5	(TTIP) + $VO(OC_3H_7)_3$	-	Conductive photoswitchable material[156, 157]
Cotton and paper fibers	ZnO	ALD with $ZnEt_2$	-	Material for electrochemical devices[158]
Bacterial cellulose Acetobacter xylinum		$[Zn(CH_3CO_2)_2]$	NP ∅10-25nm	Materials for photocatalysis[159]
Bacterial cellulose Photographic paper chromatography paper			NP ∅200-700nm	MM&SC[160]
Disintegrated eucalyptus globulus fibers			NP ∅10-30nm	MM&SC[161]
Whatman filter paper (40)			NP ∅60-90nm	Photocatalysis[162]
Microcrystalline cellulose powder			NP ∅10-150nm	MM&SC[96]
Uzbekistan cotton fibers			10-15	Photoluminescent cellulose-ZnO membrane[163]
Filter paper		Dissolved ZnO		Material for Solar cell support[164]
	ZrO_2	$(Zr(OnBu)_4)$.		MM&SC[126]
Powdered cellulose		$(Zr(OnBu)_4)$.	5-30	[130]
Cellulose microcrystalline powder, filter paper chromatography paper regenerated cellulose cotton adsorbent	ZrO_2, La_2O_3 CeO_2, and Al_2O_3 mixed oxides	Metal Nitrate	5-130	MM&SC[165]
Rattan *Calamus rotang*	ZnO@Al_2O_3	Al and Zn metal (CVD + oxidation)	-	Luminescent materials[143]

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