Supporting Information Available

Antibacterial and photochemical properties of cellulose nanofibers–titania nanocomposites loaded with two different types of antibiotic medicines

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Surface modification

Cellulose nanofibers surface were modified by Phosphomycin and Tetracycline in amounts calculated to achieve uniform, single layer coverage. The surface of titania was estimated using simple mathematical model where the particles are spherical, uniform and homogenous. According to our assumption that drug bonded with the biopolymer through interaction with TiO_2, we firstly calculated the total number of titania nanoparticles, which was added to the cellulose nanofibers, by following formula:

$$N_{total} = m_{total}/m_p$$

where m_{total} – total mass of TiO_2 particles (g), m_p – mass of the single TiO_2 particle (g).

The total surface area of titania nanoparticles grafted onto cellulose nanofibers can be estimated as follows:

$$S_{total} = N_{total} \cdot S_p$$

where N_{total} – total number of titania nanoparticles, S_p - surface of the single TiO_2 particle (nm^2). Then, the amount of drug n (mol) can be found as follows:

$$n = S_{total} \cdot N_A / S$$

where S – area of functional group (nm^2) and N_A is Avogadro number. The approximate area of 0.24 nm^2 per phoshponate group is commonly proposed in literature[1] and utilized by us in our previous papers[2,3].

Table S1 Antimicrobial activity of samples against *S.aureus* and *E.coli*. The means (mm) ± standard deviation for at least three replicates are illustrated. (*na = no activity)

Sample	*S.aureus*		*E.coli*	
	Concentration (µg/disk)	Inhibition zone (mm)	Concentration (µg/disk)	Inhibition zone (mm)
CNF_TC_M0	1	23.5±2.9	1	14.5±1.7
	10	30.5±0.6	10	22.0±0.8
	50	34.0±1.8	50	27.3±1.7
	100	38.3±2.6	100	32.8±2.2
CNF_TiO_2_TC_M1	1	19.3±3.4	1	9.3±2.1
	10	25.8±3.7	10	16.3±0.5
	50	32.5±4.7	50	21.0±1.4
	100	32.3±4.4	100	23.3±0.5
CNF_Phos_M0	10	28.5±3.2	50	25.0±0.0
	50	42.0±7.2		
	100	45.8±5.5	100	29.0±2.8
CNF_TiO_2_Phos_M2	10	na*	50	na
	50	na		
	100	na	100	na

Table S2 The antimicrobial effect of samples against *S.aureus* obtained from the liquid broth assay

Sample	Concentration (µg/ml)	Time delay (h)	Growth inhibition (%)
CNF_TC_M0	1	0	100
CNF_TiO_2_TC_M1	1	0	100
CNF_Phos_M0	100	0	100
CNF_TiO_2_Phos_M2	100	0*	100
		0	96.6
		12	99.2
		18	98.1
		24	96.6

(*) with addition of citrate buffer (pH=6,0.03M)

Figure FS1 FTIR of the CNF_TiO_2_Phos_M2 compared to CNF_TiO_2 and PCNF.

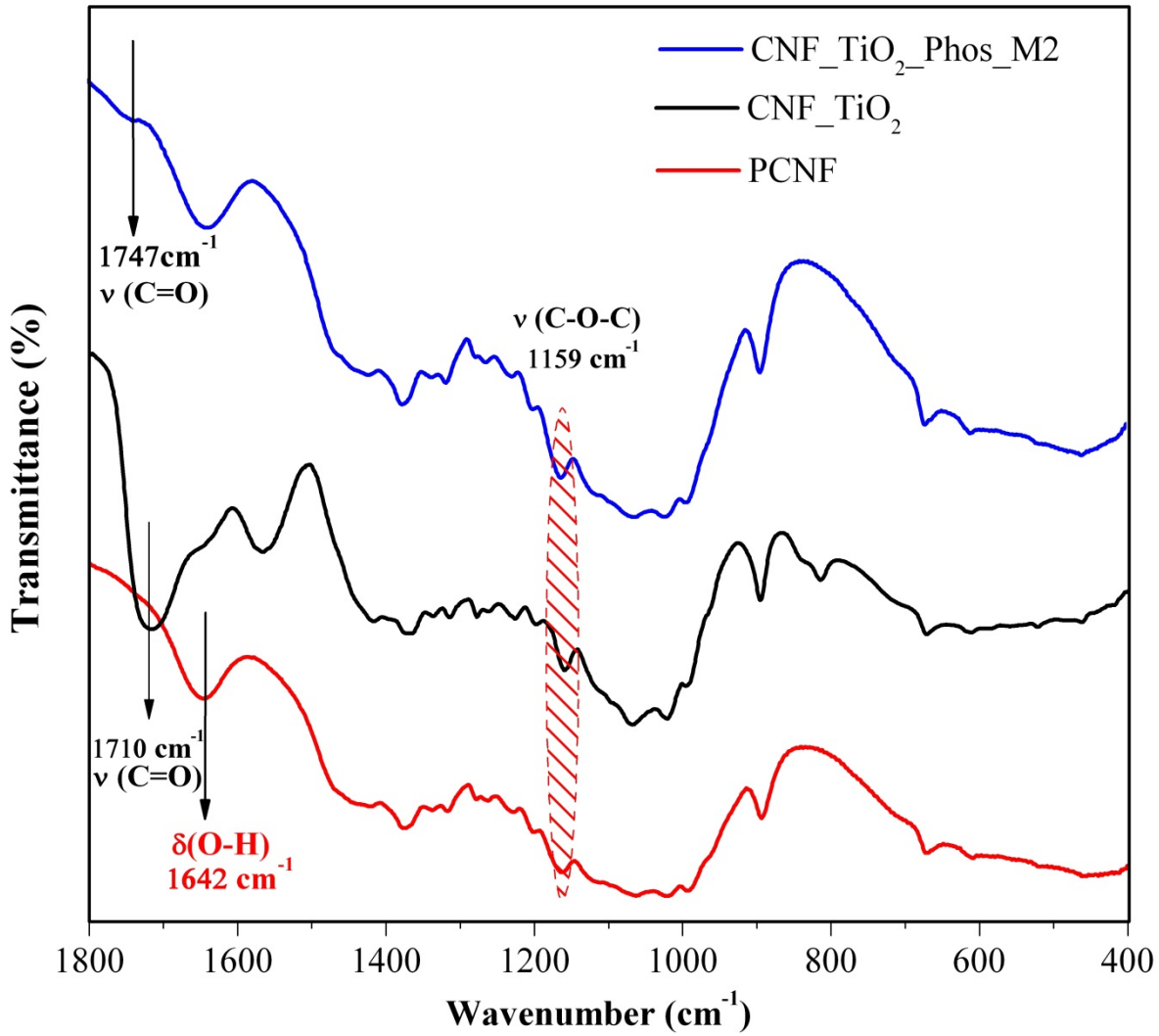


Figure FS2 UV-Vis spectrum of the CNF_TiO_2_Phos_M2 material in the form of thin transparent film.

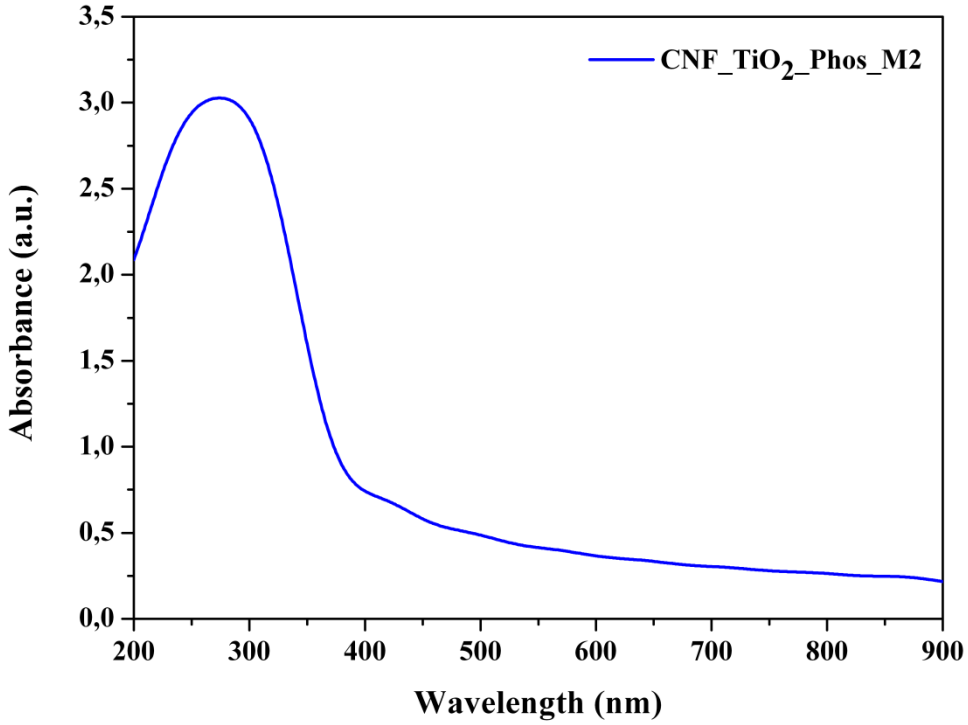


Figure FS3 High resolution TEM view of the applied TiO2 nanoparticles (reprinted with permission from Angew. Chem. Int. Ed. 2008, 47, 8506 –8509)

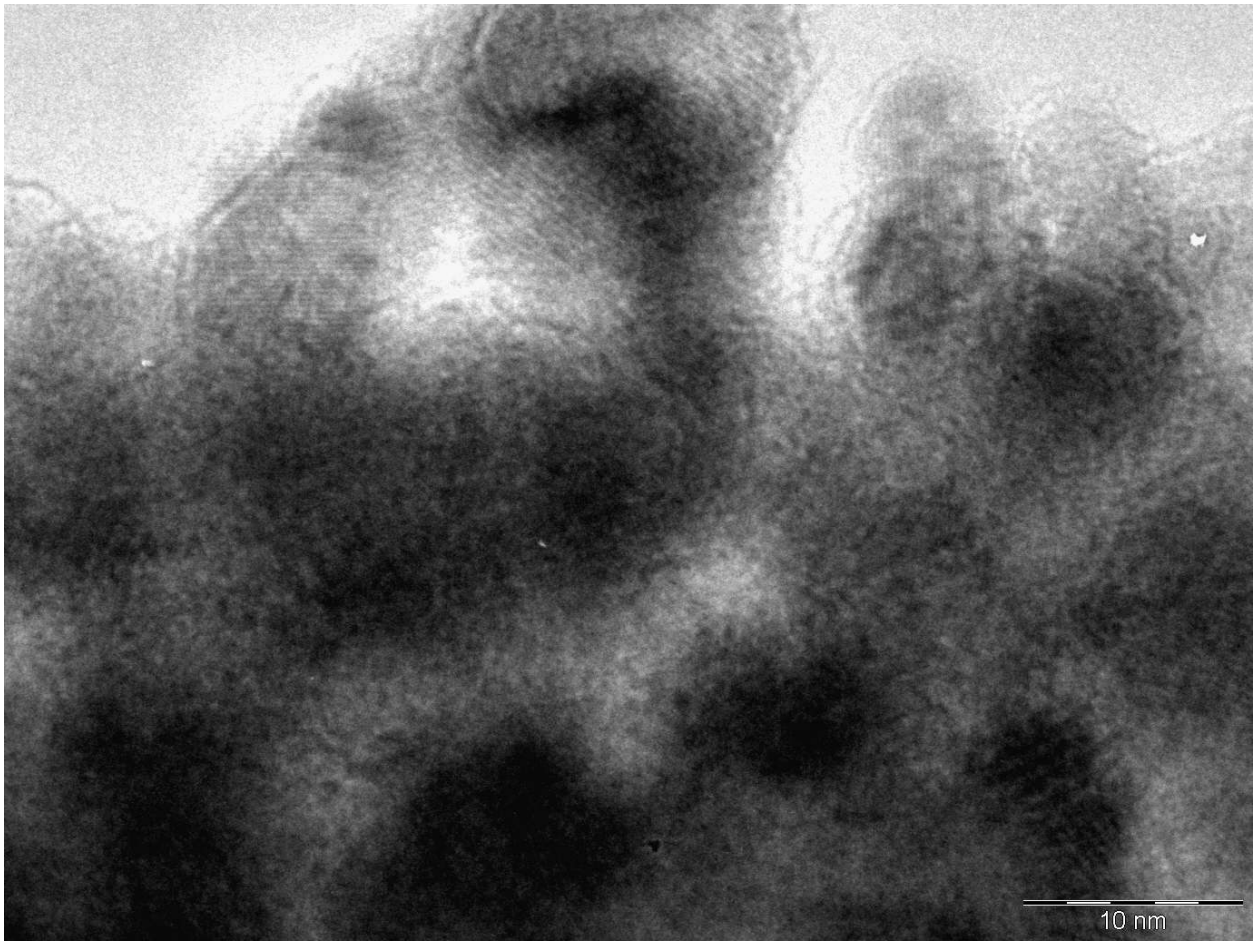
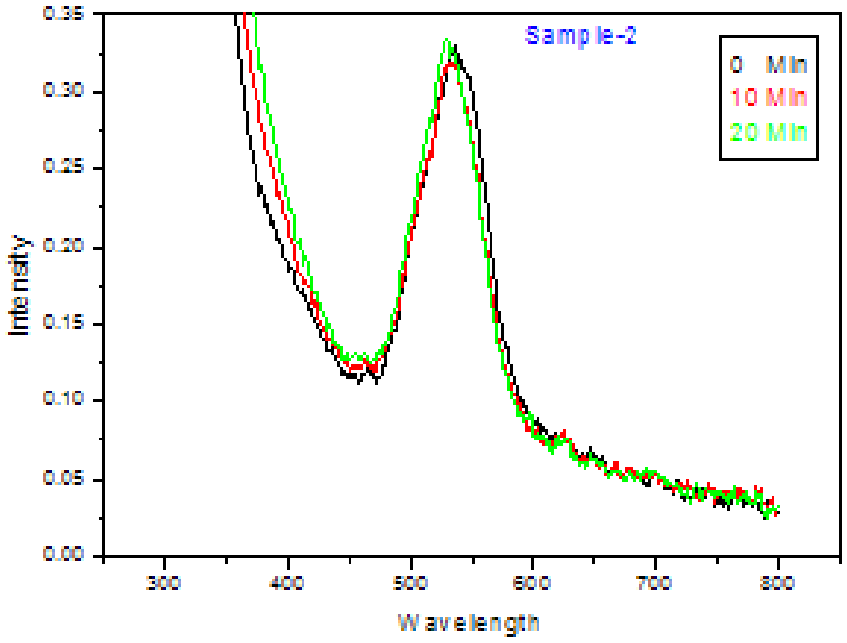


Figure FS4 The stability demonstration for solutions of Rhodamine B in the presence of the applied TiO2 nanoparticles (reprinted with permission from the supplementary materials to Angew. Chem. Int. Ed. 2008, 47, 8506 –8509)



References

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