

SUPPLEMENTARY INFORMATION

Nondestructive, real-time determination and visualization of cellulose, hemicellulose and lignin by luminescent oligothiophenes

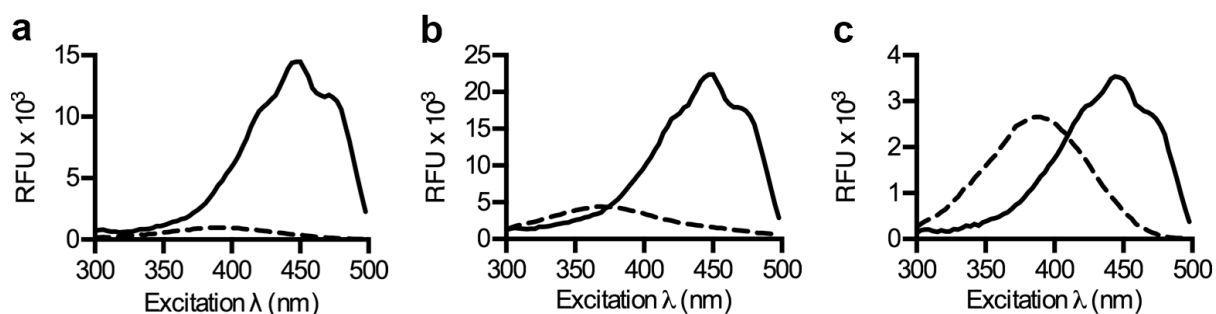
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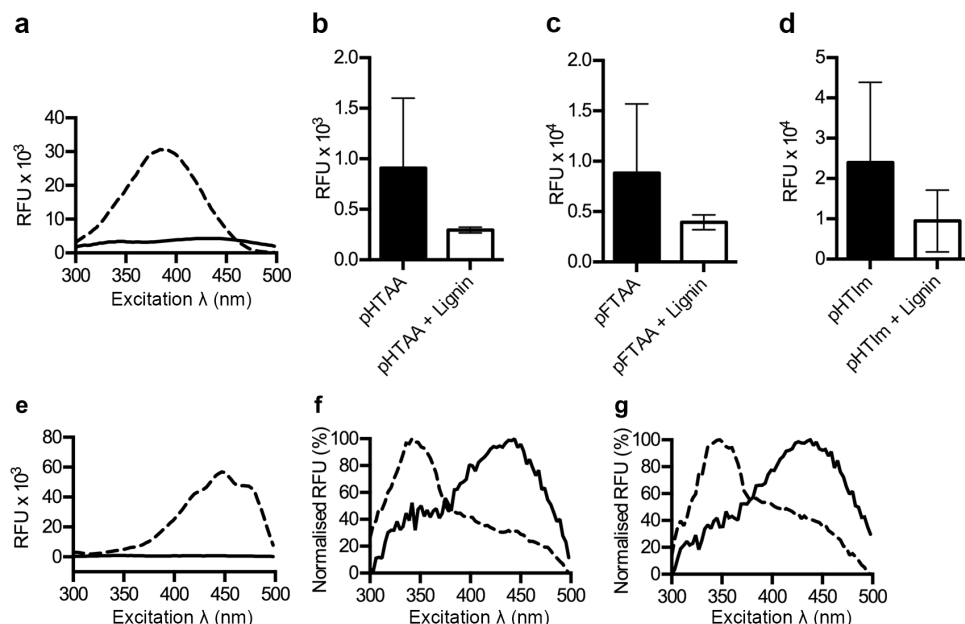
Supplementary Figure 1



Binding of pHTEA to cellulose results in increased amplitude of the fluorescence signal.

Excitation spectra of pHTEA bound to the cellulosic materials. Spectra were collected at $\lambda_{Ex} = 300 - 500$ nm and $\lambda_{Em} = 545$ nm of pHTEA mixed with (a) M. cellulose, (b) pulp cellulose, and (c) cellulose nanofibrils (solid lines). RFU = Relative fluorescence unit. Dashed line = pHTEA in D_2O .

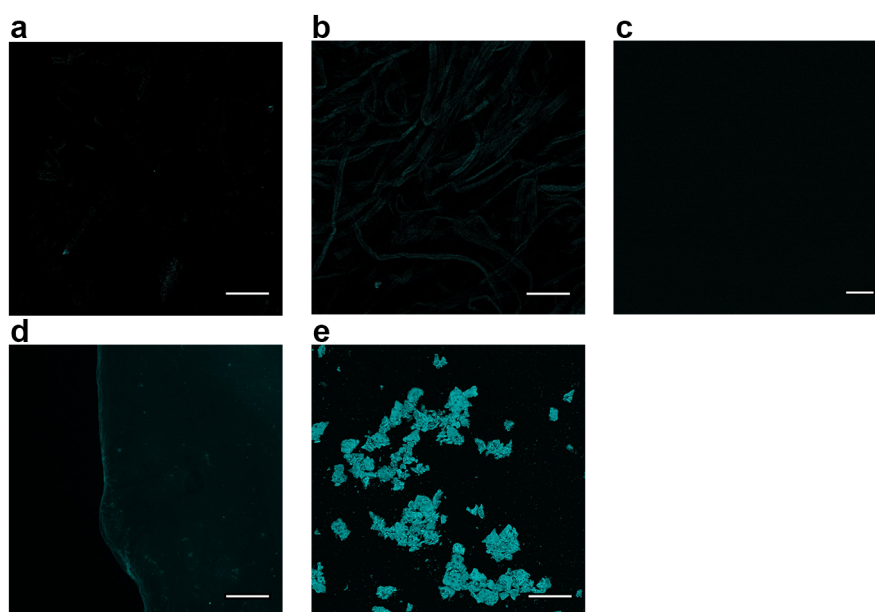
Supplementary Figure 2



Binding of pHTEA to lignin enables optical identification of lignin in mixed samples.

(a) Excitation spectra of pHTEA with 0 (dashed) and 5 mg/ml lignin (solid) collected at $\lambda_{\text{Ex}} = 300 - 500$ nm, $\lambda_{\text{Em}} = 545$ nm. (b) Comparison of fluorescence signals at $\lambda_{\text{max-pHTEA}}$ ($\lambda_{\text{Ex}} 387$ nm, $\lambda_{\text{Em}} 545$ nm) of pHTEA, (c) pFTAA and (d) pHTIm in the presence and absence of 5 mg/ml of lignin. (e) Excitation spectra of pHTEA bound to 1.25 mg/ml cellulose before (dashed) and after (solid) addition of 5 mg/ml lignin. (f) Normalised excitation spectra of pHTEA + 1.25 mg/ml lignin (dashed) and pHTEA + 1.25 mg/ml lignin + 5 mg/ml cellulose (solid). (g) Normalised excitation spectra of intrinsic fluorescence of 1.25 mg/ml lignin (dashed) and 1.25 mg/ml lignin + 5 mg/ml cellulose (solid). All panels show the mean of three technical repeats from one out of three experimental repeats. RFU = Relative fluorescence unit. All experiments are performed in D_2O , pHTEA is used at 3 μM .

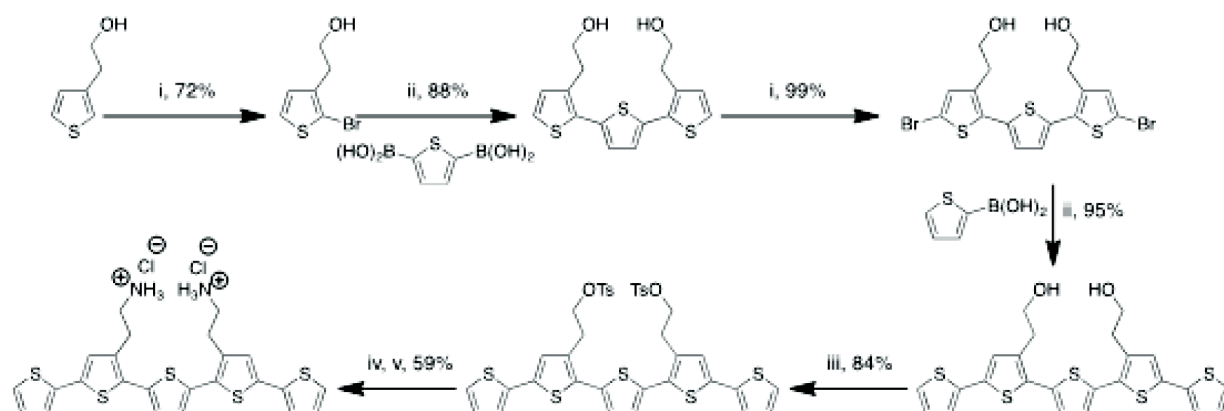
Supplementary Figure 3



Fluorescence of cellulose materials analyzed by confocal microscopy.

Fluorescence confocal microscopy showing the inherent fluorescence of (a) M. cellulose, (b) pulp cellulose, (c) cellulose nanofibrils, (d) paper made of cellulose nanofibrils, and (e) lignin. Excitation at 473 nm and bandwidth filters detecting 490 - 530 nm were applied. Scale bar = 200 μ m.

Supplementary Figure 4



Schematic illustration of the pHTEA synthesis scheme.

Reagents and conditions are as follows: (i) N-bromosuccinimide, DMF, -10°C ; (ii) PEPPSI-IPr, K_2CO_3 , toluene/methanol (1:1), 75°C ; (iii) p-toluenesulphonyl chloride, pyridine, CHCl_3 ; (iv) NHBoc_2 , DMF, 75°C ; (v) HCl (conc), dioxane. Numbers in % denotes the overall yield. Full description of the synthesis is found in Reference 26 and 27.