Supplemental Information

Green bionanocomposites from high-elasticity “soft” polyurethane and high-crystallinity “rigid” chitin nanocrystals with controlled surface acetylation

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Amount of Surface Hydroxyl Groups \( n_{\text{surface-OH}} \) on Chitin Nanocrystals

\[
n_{\text{surface-OH}} = \frac{N_1 N_2}{N_A}
\]  
\( S - 1 \)

\[
N_1 = \frac{w}{\rho_{\text{chitin}}} / V_{\text{ChN}} = \frac{w}{\rho_{\text{chitin}}} / \left( \frac{\pi D^2 L}{4} \right)
\]  
\( S - 2 \)

\[
N_2 = 4 \left( \frac{S_{\text{chN}}}{S} \right) = 4 \frac{\pi DL}{ab}
\]  
\( S - 3 \)

in here, \( N_A = 6.02 \times 10^{23} \) mol\(^{-1} \) (Avogadro’s number), \( \rho_{\text{chitin}} = 1.425 \) g/cm\(^3\), \( w = 1 \) g

The data of size of the unit cell of chitin \( (a, b) \) and density of chitin crystallites \( (\rho_{\text{chitin}}) \) were from following references:

**Figure S1.** Size statistics for length ($L$, image A) and diameter ($D$, image B) of AChN from TEM images; dashed lines are Gaussian distribution fitting line according to the statistical data.

**Figure S2.** DSC thermograms of PU-based nanocomposites filled with various contents of AChN.
Figure S3. Amplified FTIR spectra of PU/AChN nanocomposites and neat PU material at the regions of 3600–3100 cm$^{-1}$ and 1800–1650 cm$^{-1}$. (a) PU, (b) PU/AChN-2, (c) PU/AChN-4, (d) PU/AChN-6, (e) PU/AChN-8, (f) PU/AChN-10.