Supporting Information

The Role of Nanoparticle Shapes and Structures in Material Characterisation of Polyvinyl Alcohol (PVA) Bionanocomposite Films

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Figure S1. Characterisations of PVA/3wt% Cloisite 30B clay bionanocomposites: (a) height mapping image and (b) height profiles on cut-line sections A51-B51 and A52-B52.
Figure S2. Frequency distributions of dimensions of HNTs embedded within PVA/HNT bionanocomposites at different HNT contents: (a) and (b) for HNT length and diameter (3 wt% HNTs), (c) and (d) for HNT length and diameter (5 wt% HNTs), as well as (e) and (f) for HNT length and diameter (10 wt% HNTs).
Figure S3. Frequency distributions of dimensions of Cloisite 30B clays embedded within PVA/Cloisite 30B clay bionanocomposites at different clay contents: (a) and (b) for clay length and thickness (3 wt% Cloisite 30B clays), (c) and (d) for clay length and thickness (5 wt% Cloisite 30B clays), as well as (e) and (f) for length and thickness (10 wt% Cloisite 30B clays).
Figure S4. Frequency distributions of dimensions of NBCs embedded within PVA/NBC bionanocomposites at different NBC contents: (a) and (b) for NBC thickness and diameter (3 wt% NBCs), (c) and (d) for NBC thickness and diameter (5 wt% NBCs), as well as (e) and (f) for NBC thickness and diameter (10 wt% NBCs).
| Material type     | $T_g$ (°C) | $\Delta H_m$ (J/g) | $\chi_c$ (%) | $T_m$ (°C) | $T_{5\%}$ (°C) | $T_{80\%}$ (°C) | $T_d$ (°C) | $T_d'$ (°C) |
|------------------|------------|-------------------|--------------|------------|----------------|----------------|------------|------------|
| PVA              | 65.19      | 50.8              | 36.65        | 222.91     | 200.15         | 363.5          | 274.23     |            |
| PVA/HNT/3 wt%    | 65.13      | 50.5              | 37.6         | 224.74     | 265.29         | 387            | 283.2      |            |
| PVA/HNT/5 wt%    | 65.86      | 50.2              | 38.2         | 225.13     | 268.06         | 422.87         | 286.47     | 340.12     |
| PVA/HNT/10 wt%   | 64.91      | 44.15             | 35.4         | 226.67     | 270.21         | 428.03         | 287.13     | 335.26     |
| PVA/Cloisite30B 3 wt% | 67.5      | 49.6              | 36.9         | 220.44     | 253.3          | 387.9          | 282.21     |            |
| PVA/Cloisite30B 5 wt% | 70.2      | 49.09             | 37.2         | 221.62     | 261.1          | 407.12         | 287.41     |            |
| PVA/Cloisite30B 10 wt% | 71.8     | 45.01             | 36.1         | 221.06     | 265.3          | 435.3          | 290.13     |            |
| PVA/NBC/3 wt%    | 70.53      | 50.01             | 37.21        | 222.12     | 256.3          | 390.67         | 278.48     |            |
| PVA/NBC/5 wt%    | 73.46      | 49.77             | 38.83        | 221.57     | 262.96         | 440.28         | 283.4      | 303.77     |
| PVA/NBC/10 wt%   | 75.06      | 48.16             | 40           | 222.63     | 270.73         | 464.03         | 294.61     | 324.12     |