

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

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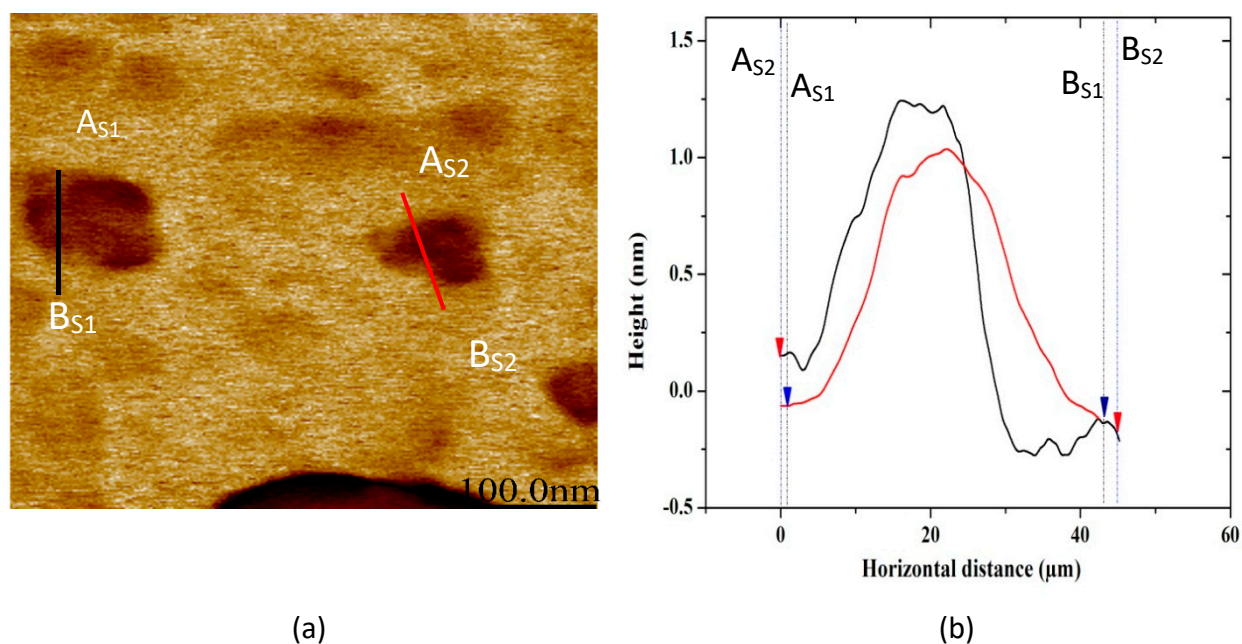


Figure S1. Characterisations of PVA/ 3wt% Cloisite 30B clay bionanocomposites: (a) height mapping image and (b) height profiles on cut-line sections AS1-BS1 and AS2-BS2.

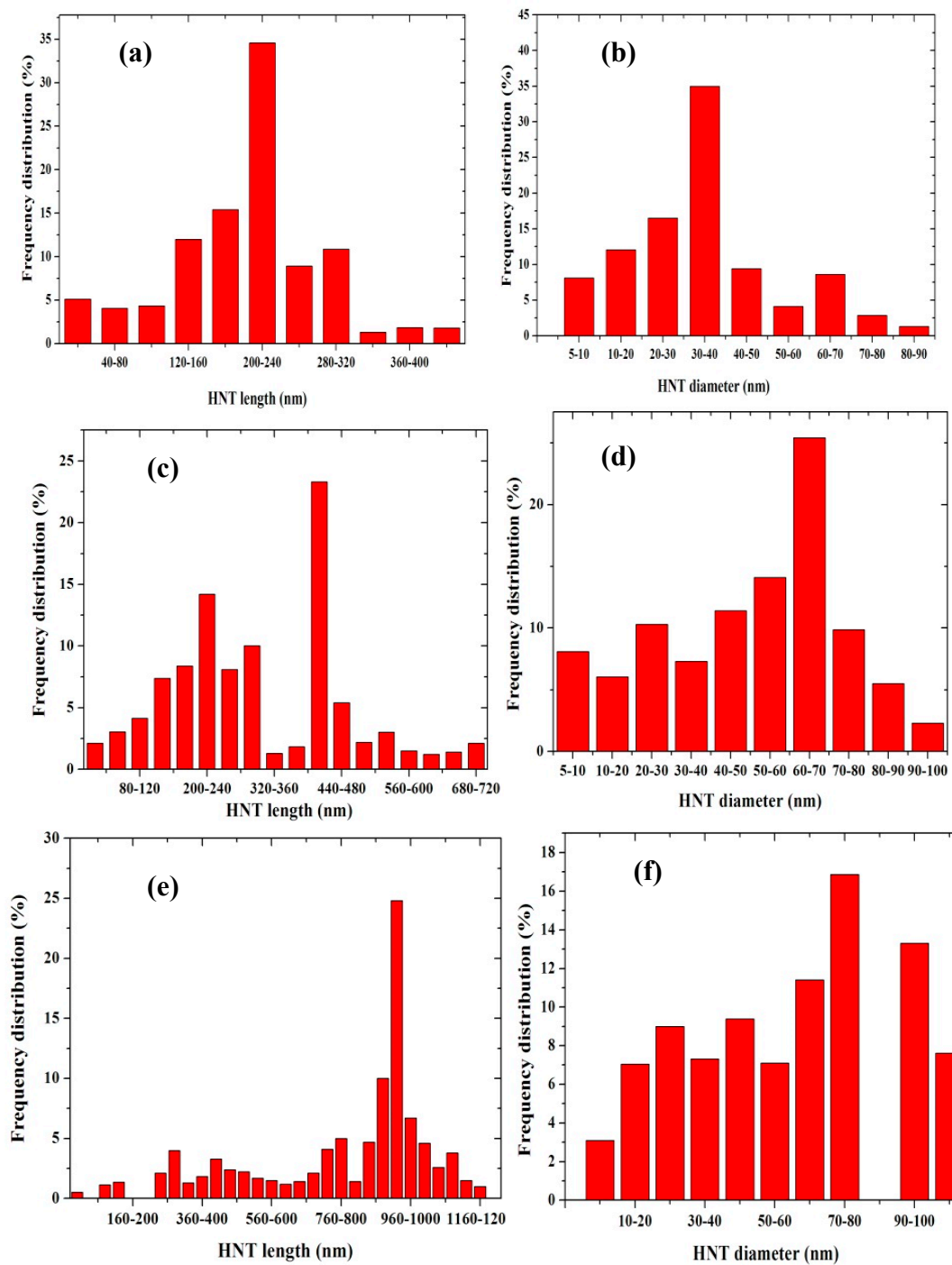


Figure S2. Frequency distributions of dimensions of HNTs embedded within PVA/HNT bionanocomposites at different HNT contents: (a) and (b) for HNT length and diameter (3 wt% HNTs), (c) and (d) for HNT length and diameter (5 wt% HNTs), as well as (e) and (f) for HNT length and diameter (10 wt% HNTs).

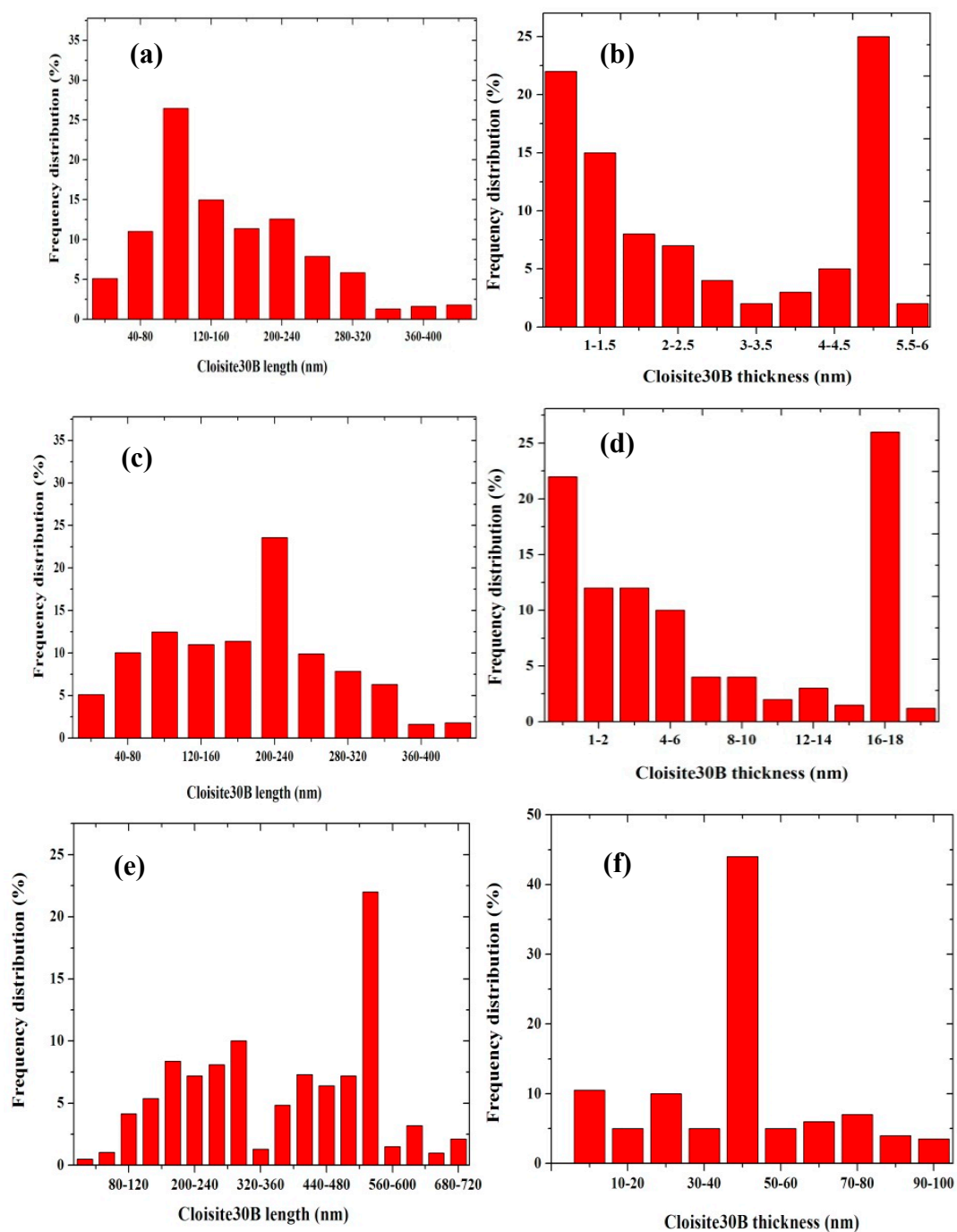


Figure S3. Frequency distributions of dimensions of Cloisite 30B clays embedded within PVA/Cloisite 30B clay bionanocomposites at different clay contents: (a) and (b) for clay length and thickness (3 wt% Cloisite 30B clays), (c) and (d) for clay length and thickness (5 wt% Cloisite 30B clays), as well as (e) and (f) for length and thickness (10 wt% Cloisite 30B clays).

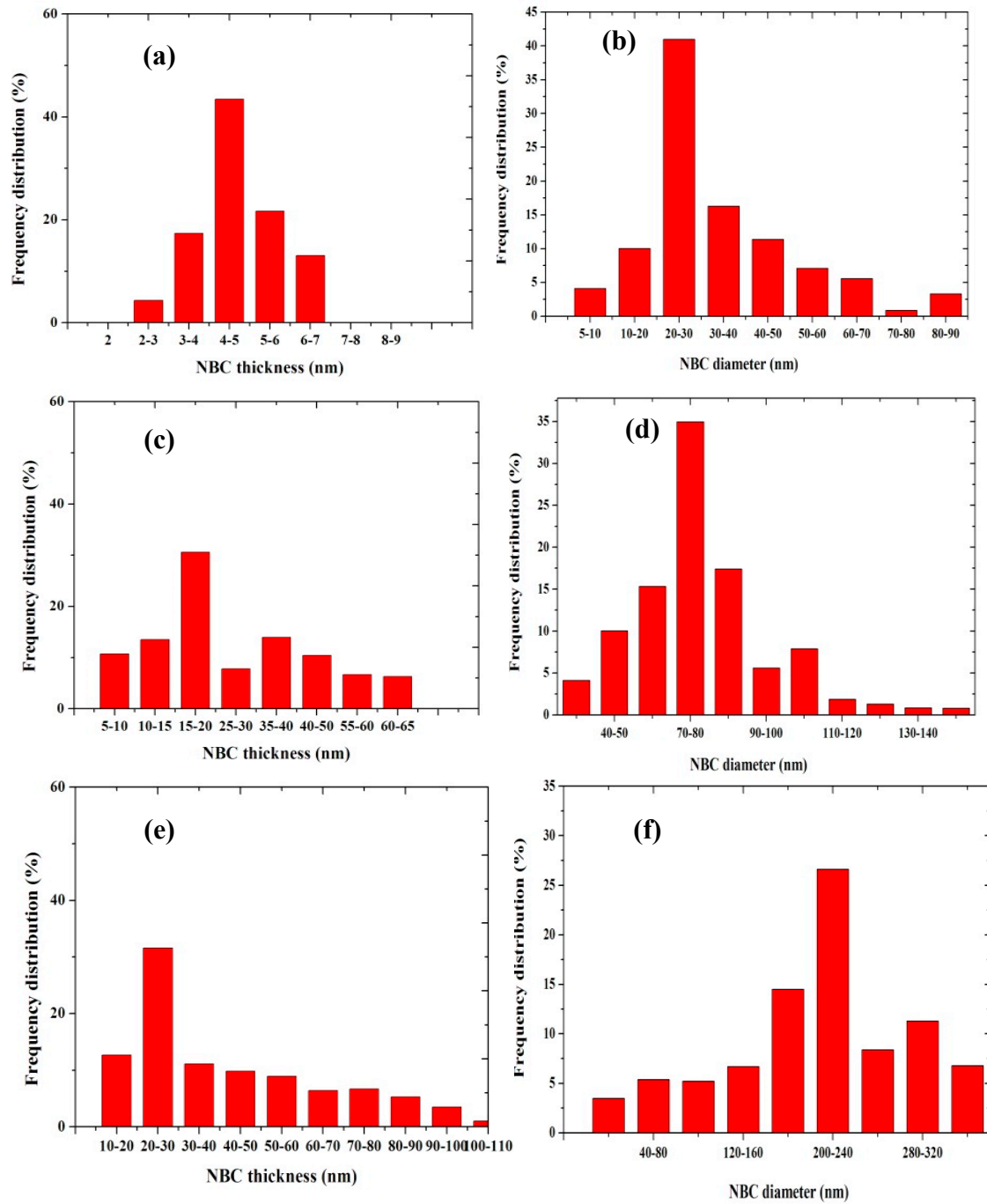


Figure S4. Frequency distributions of dimensions of NBCs embedded within PVA/NBC bionanocomposites at different NBC contents: (a) and (b) for NBC thickness and diameter (3 wt% NBCs), (c) and (d) for NBC thickness and diameter (5 wt% NBCs), as well as (e) and (f) for NBC thickness and diameter (10 wt% NBCs).

Table S1. Thermal properties of PVA bionanocomposite films.

Material type	T_g (°C)	ΔH_m (J/g)	χ_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/Cloisite 30B /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