Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Incorporation of inorganic fullerene-like WS_2 into poly(ethylene succinate) to prepare novel biodegradable nanocomposites: A study on isothermal and dynamic crystallization

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The most important characteristic DSC data obtained from both isothermal and non-isothermal crystallization are as follows:

Table S1: DSC data obtained from isothermal mode

	Isothermal state				Heating					
	T_C (°C)	t_{max} [a] (min)	FWHM[b] (min)	ΔH_C (J/g)	T_{CC} (°C)	ΔH_{CC} (J/g)	T_{m1} (°C)	T_{m2} (°C)	ΔH_m (J/g)	X_C (%)
PES	30	7.56	8.54	53.7	73.6	8.4	89.0	99.6	67.5	37.5
	40	4.98	5.37	57.4	74.7	9.1	88.9	99.8	67.1	37.3
	50	4.86	5.28	60.6	77.0	8.9	89.5	99.6	68.2	37.9
	60	8.49	9.86	62.4	81.3	6.4	91.3	99.5	70.7	39.3
IF-WS_2 (0.1%)	30	1.80	1.23	47.4	73.0	9.1	88.6	99.5	73.5	40.9
	40	1.65	1.35	46.2	74.4	9.8	88.4	99.4	72.9	40.5
	50	1.65	1.40	51.2	77.2	9.5	89.4	99.7	74.0	41.2
	60	2.64	2.38	61.0	81.4	7.5	91.5	99.7	75.6	42.0
IF-WS_2 (0.2%)	30	2.43	2.24	39.4	73.0	9.0	88.0	99.3	72.8	40.5
	40	1.29	1.04	41.7	74.4	9.8	88.3	99.4	72.0	40.1
	50	1.26	0.94	50.2	77.2	9.5	89.3	99.6	73.1	40.7
	60	2.28	1.81	60.9	81.4	5.4	91.3	99.4	74.6	41.5
IF-WS_2 (0.5%)	30	5.94	6.22	49.1	73.0	9.0	88.0	99.8	72.3	40.4
	40	3.39	3.60	50.4	74.4	9.7	88.6	99.7	71.8	40.1
	50	3.06	3.03	54.5	77.2	9.4	89.4	99.8	72.9	40.7
	60	4.80	5.02	61.2	81.3	7.2	91.4	100.0	74.4	41.5
IF-WS_2 (1.0%)	30	3.60	3.74	41.2	73.0	9.0	88.0	99.6	71.6	40.2
	40	2.10	2.01	43.1	74.4	9.7	88.7	99.8	71.2	40.0
	50	1.95	1.77	50.3	77.2	9.4	89.4	99.7	72.1	40.5
	60	3.18	2.98	59.9	81.3	6.6	91.3	99.8	74.8	42.0

[a]Time to reach the maximum rate of crystallization obtained experimentally

[b]Full width at half maximum

Table S2: DSC data obtained from non-isothermal mode

	IF-WS_2 Content (%)	Cooling					Heating (10 °C/min)							
		T_C (°C)	T_0 (°C)	ΔT_C (°C)	ΔH_C (J/g)	X_C (%)	T_g (°C)	T_{CC1} [a] (°C)	ΔH_{CC1} [a] (J/g)	T_{CC2} [b] (°C)	ΔH_{CC2} [b] (J/g)	T_{m1} (°C)	T_{m2} (°C)	$\Sigma\Delta H_m$ (J/g)
	PES	50.7	60.7	10.0	66.2	36.8	-10	_	_	77.5	8.5	90.1	99.8	70.4
	0.1	58.0	64.8	6.3	66.1	36.7	-11	_	_	81.0	6.6	91.5	99.7	73.3
Cooling rate	0.2	58.9	64.5	5.6	65.7	36.5	-10	_	_	81.5	6.2	91.5	99.6	73.1
2 °C/min	0.5	55.3	63.6	8.3	64.0	35.6	-11	_	_	80.4	7.1	91.1	99.8	71.7
	1.0	57.1	63.6	6.5	64.5	35.8	-11	_	_	80.4	7.2	91.1	99.8	71.4
	PES	40.6	56.5	15.9	37.2	20. 7	-15	42.2	20.6	75.1	9.0	88.2	99.8	71.3
	0.1	49.5	59.9	10.4	68.6	38.1	-11	_	_	76.9	8.9	89.8	99.5	75.9
Cooling rate	0.2	51.7	59.4	7.7	67.4	37.4	-11	_	_	77.9	8.7	90.0	99.6	75.3
5 °C/min	0.5	45.0	57.9	12.9	50.7	28.2	-15	40.0	11.6	74.9	9.9	89.5	99.8	74.7
	1.0	48.9	59.3	10.4	63.7	35.4	-11	35.1	1.3	76.8	9.7	89.7	99.7	72.3
	PES	36.3	53.6	17.3	6.7	3.7	-16	44.0	51.7	75.2	10.6	88.8	99.6	70.5
	0.1	40.5	56.2	15.7	48.4	26.9	-16	23.8	12.7	74.6	8.7	89.1	99.6	76.4
Cooling rate	0.2	43.3	55.6	12.3	60.7	33.7	-15	32.4	3.0	75.2	9.6	89.1	99.5	75.8
10 °C/min	0.5	38.2	55.4	17.2	14.8	8.2	-16	41.7	47.0	74.4	11.0	88.7	99.7	74.3
	1.0	40.9	55.9	15.0	41.9	23.3	-15	36.2	17.4	74.4	9.4	89.0	99.7	73.6
	PES	34.2	52.4	18.2	1.2	0. 7	-15	43.4	57.2	75.2	10.8	88.8	99.7	70.2
	0.1	34.5	53.4	18.9	9.4	5.2	-16	27.0	53.5	72.9	10.6	88.0	99.6	75.0
Cooling rate	0.2	35.3	53.0	17.7	16.2	9.0	-16	33.7	45.0	73.4	10.5	88.0	99.6	75.4
20 °C/min	0.5	34.3	52.7	18.4	2.3	1.3	-16	42.4	59.7	74.5	11.6	88.7	99.7	74.0
	1.0	35.4	53.6	18.2	9.5	5.3	-16	37.7	50.6	74.0	10.8	88.6	99.7	72.9

[a]The main cold crystallization; [b]Cold crystallization just prior to the melting endotherm

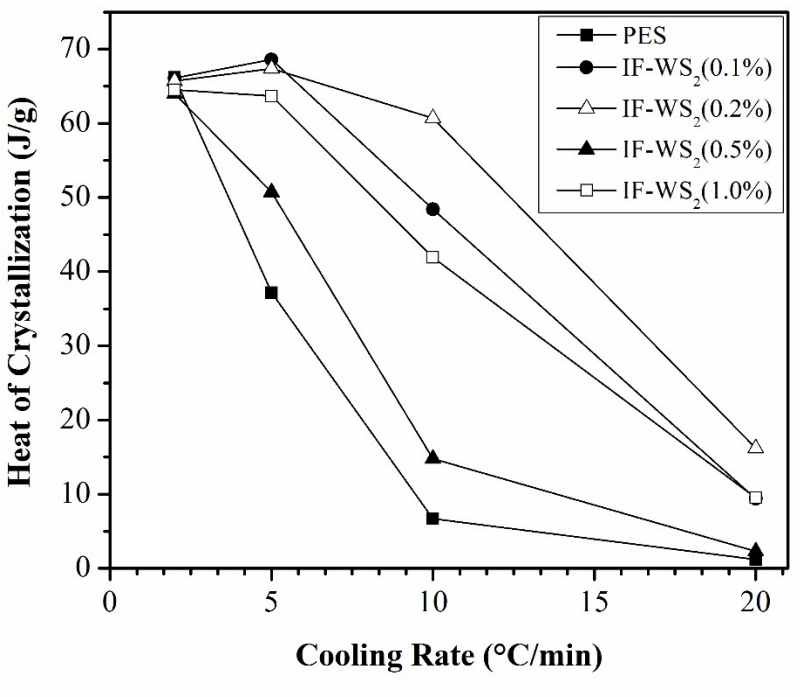

Fig. S1: Plot of heat of crystallization versus cooling rate

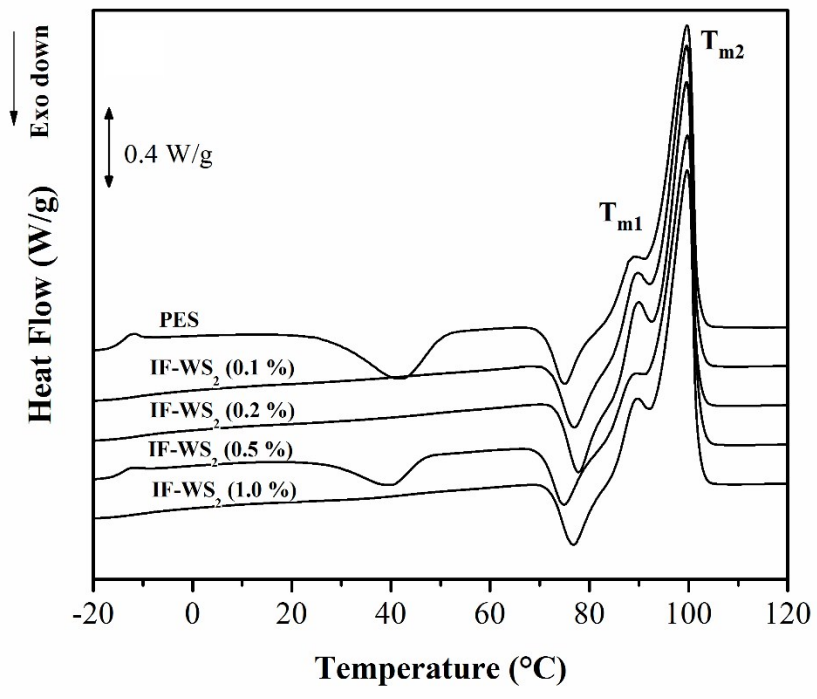

Fig. S2: Subsequent melting behavior of PES and its nanocomposites crystallized at 5 °C/min