Growth of the phase change enthalpy induced by the crystal transformation of an inorganic-organic eutectic mixture of magnesium nitrate hexahydrate-glutaric acid

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1. Uncertainties calculation of DSC

Type A uncertainty is the statistical uncertainty component, calculated by the equation given as Eq. (1):

$$\mu_A = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{(n-1)n}} \quad (1)$$

Where, μ_A is the Type A uncertainty, x_i is the experimental value for each time, $\bar{x}$ is the average of all values, n is the number of experiment times.

Type B uncertainty is the non-statistical uncertainty component, usually dependent on the instrument error and calculated by the equation given as Eq. (2):

$$\mu_B = \frac{\Delta_{\text{instrument}}}{\sqrt{3}} \quad (2)$$

Where, μ_B is the Type B uncertainty, $\Delta_{\text{instrument}}$ is the instrument error. The uncertainty of the DSC in T and ΔH correspond to 1.0 ℃ and 2.0 %.

The final uncertainty is calculated by μ_A and μ_B according to the equation given as Eq. (3):

$$\mu = \sqrt{{\mu_A}^2 + {\mu_B}^2} \quad (3)$$

The uncertainties calculation results are shown in Table 1 and Table 2.

Table 1 The uncertainties of MNH- GA binary in melting point and the melting enthalpy.

wt%	**T_m /℃**	**$\triangle H_m$ /(J·g^{-1})**	**$\mu_{\triangle Hm}$/%**
100	89.9±0.6	165.2±3.7	2.2
70	67.3±0.6	176.6±4.3	2.4
65	66.5±0.6	179.4±5.5	3.1
60	66.7±0.6	189.0±2.3	1.2
55	67.0±0.6	186.5±3.7	2.0
50	66.9±0.6	186.9±3.7	2.0
40	65.9±0.9	193.8±2.6	1.3
0	97.3±0.7	175.3±4.2	2.4

Table 2 The uncertainties of MNH- GA, MNH- GA/EG and MNH- GA/EP in melting point and the melting enthalpy before and after cycling.

Samples	T_m/℃	H_m/(J·g^{-1})	$\mu_{\Delta Hm}$/%
MNH-GA	66.7±0.6	189.0±2.3	1.2
MNH-GA/EG	63.5±0.7	75.7±3.4	4.5
MNH-GA/EP	65.1±0.6	102.3±7.3	7.1
MNH-GA/EP-without cover (100 cycles)	63.3±0.6	59.9±3.5	5.9
MNH-GA/EP-with cover (100 cycles)	62.3±0.6	100.0±1.6	1.6

2. Video recording of crystallization process

Supplementary Information.mp4

Video 1 The crystallization process video of 60 wt% MNH-GA eutectic mixture.