**Supplementary Information: Melting and Crystallization Parameters**

The following tables contain a series of parameters for the first (F1) and second (F2) melting events and for the melt (C1) and cold (C2) crystallization events obtained by point-by-point integration of the raw time-temperature-heat flow data reported by the DSC. As explained in the text the integration procedure and parameter estimate was performed by custom software, based on the visual determination of the start and end points of each event. A linear virtual baseline joining these points was utilized in all cases. Six tables are included for each of the five formulations tested: neat PHB and PHB/CB compounds with 0.5%, 1%, 5%, and 10% carbon black (CB).

Tables 1 to 4 contain the following parameters:

** (°C/min) heating/cooling rate

*T*0.1% (°C) temperature for 0.1% molten/crystallized fraction (a good estimate of the initial point of the event)

*T*50% (°C) temperature for 50% molten/crystallized fraction (a better estimate of the “characteristic” melting/crystallization temperatures than the peak values, in particular for events represented by complex DSC peaks)

*T*99.9% (°C) temperature for 99.9% molten/crystallized fraction (a good estimate of the final point of the event)

*Tmp*, *Tc* (°C) peak melting/crystallization temperatures

*cmax* (min-1) maximum melting/crystallization rate (measured in the normalized plot)

**½ (min) half crystallization time (time to reach 50% crystallized fraction from the start of the event)

*Hm*, *Hc*, (J/g) latent heat of melting/crystallization

*Xc* (%) change in crystallinity during the event (estimated from the latent heats assuming *H*°*m* = 146 J/g)

Numbers in *italic* correspond to the minor peak; temperature values in [square brackets] are for hidden peaks (shoulders). A uniform data format is used throughout: temperatures are quoted to ±0.1ºC, rates to ±0.001min-1, latent heats to ±0.1 J/g, etc.; this format shouldn’t be taken as an indication of the intrinsic precision of the results.

Table 5 includes an analysis of the relative peak height of the minor/major components of the complex melting peaks.

Table 6 includes an analysis of the relative peak area (crystallinity) of the melt/cold crystallization peaks.

**Table 1.1. Neat PHB - First Melting Event (F1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 154.5 | 169.7 | 180.7 | 171.8 | *178.9* | 0.194 | *0.109* | 56.1 | 38.4 |
| 4 | 155.7 | 169.8 | 183.0 | 171.7 | *179.9* | 0.382 | *0.204* | 52.1 | 35.7 |
| 6 | 145.8 | 167.7 | 183.8 | 170.0 | *180.1* | 0.428 | *0.239* | 66.5 | 45.5 |
| 8 | 123.9 | 166.4 | 184.4 | 168.4 | *180.4* | 0.526 | *0.214* | 81.5 | 55.9 |
| 12 | 135.8 | 166.2 | 185.3 | 167.7 | *181.2* | 0.764 | *0.351* | 71.7 | 49.1 |
| 16 | 145.0 | 166.7 | 186.6 | 168.1 | *181.8* | 1.148 | *0.401* | 64.9 | 44.5 |
| 24 | 139.0 | 168.3 | 191.8 | 170.0 | *184.1* | 1.274 | *0.491* | 62.9 | 43.1 |
| 32 | 138.5 | 170.4 | 195.3 | 171.1 | *185.5* | 1.365 | *0.585* | 60.3 | 41.3 |

**Table 1.2. Neat PHB - Second Melting Event (F2)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 153.1 | 167.2 | 172.3 | [155] | 169.1 | - | 0.293 | 60.6 | 41.5 |
| 4 | 152.7 | 168.3 | 175.7 | [157] | 170.5 | - | 0.516 | 60.0 | 41.1 |
| 6 | 144.4 | 167.8 | 174.5 | [157] | 170.4 | - | 0.677 | 67.6 | 46.3 |
| 8 | 146.8 | 167.6 | 176.6 | [158] | 170.2 | - | 0.858 | 71.3 | 48.8 |
| 12 | 147.5 | 167.9 | 177.0 | [158] | 170.6 | - | 1.219 | 64.2 | 44.0 |
| 16 | 146.5 | 167.9 | 178.4 | [159] | 170.9 | - | 1.452 | 64.5 | 44.2 |
| 24 | 146.7 | 169.3 | 185.2 | [162] | 172.6 | - | 1.669 | 58.4 | 40.0 |
| 32 | 148.4 | 170.1 | 188.4 | [162] | 173.2 | - | 2.049 | 51.7 | 35.4 |

**Table 1.3. Neat PHB - Melt Crystallization Event (C1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | 80.3 | 66.8 | 42.4 | 69.3 | 0.120 | 6.76 | 49.1 | 33.6 |
| 4 | 99.6 | 61.7 | 28.6 | 58.0 | 0.121 | 9.49 | 34.6 | 23.7 |
| 6 | 83.5 | 59.2 | 39.2 | 58.4 | 0.257 | 4.04 | 17.8 | 12.2 |
| 8 | 76.6 | 56.3 | 32.6 | 56.7 | 0.323 | 2.54 | 12.3 | 8.5 |
| 12 | 67.3 | 52.9 | 39.0 | 52.7 | 0.682 | 1.21 | 2.1 | 1.4 |
| 16 | - | - | - | - | - | - | - | - |
| 24 | - | - | - | - | - | - | - | - |

**Table 1.4. Neat PHB - Cold Crystallization Event (C2)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | - | - | - | - | - | - | - | - |
| 4 | 40.5 | 48.3 | 56.1 | 49.1 | 0.595 | 1.96 | 8.1 | 5.5 |
| 6 | 43.9 | 51.4 | 60.1 | 52.1 | 0.829 | 1.23 | 15.9 | 10.9 |
| 8 | 44.2 | 54.2 | 65.3 | 54.6 | 0.996 | 1.22 | 26.7 | 18.3 |
| 12 | 47.6 | 59.3 | 69.8 | 59.7 | 1.403 | 0.95 | 34.5 | 23.6 |
| 16 | 49.9 | 62.7 | 75.9 | 62.9 | 1.659 | 0.78 | 38.9 | 26.6 |
| 24 | 57.7 | 73.7 | 95.2 | 73.7 | 1.797 | 0.64 | 42.9 | 29.4 |

**Table 1.5. Neat PHB - Comparison of Normalized Minor/Major Melting Peak Height**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ** (°C/min) | F1 | | F2 | | *c*minor/*c*major (F1) | *c*minor/*c*major (F2) |
| *c*major | *c*minor | *c*major | *c*minor |
| 2 | 0.194 | *0.109* | 0.293 | 0 | 0.56 | 0 |
| 4 | 0.382 | *0.204* | 0.516 | 0 | 0.53 | 0 |
| 6 | 0.428 | *0.239* | 0.677 | 0 | 0.56 | 0 |
| 8 | 0.526 | *0.214* | 0.858 | 0 | 0.41 | 0 |
| 12 | 0.764 | *0.351* | 1.219 | 0 | 0.46 | 0 |
| 16 | 1.148 | *0.401* | 1.452 | 0 | 0.35 | 0 |
| 24 | 1.274 | *0.491* | 1.669 | 0 | 0.39 | 0 |
| 32 | 1.365 | *0.585* | 2.049 | 0 | 0.43 | 0 |

**Table 1.6. Neat PHB - Comparison of Melt and Cold Crystallinity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **(°C/min) | *Xc* (C1) | *Xc*(C2) | *X*TOTAL | *Xc* (C1)/*X*TOTAL | *Xc* (C2)/*X*TOTAL |
| 2 | 33.6 | - | 33.6 | 100 | 0 |
| 4 | 23.7 | 5.5 | 29.2 | 81.2 | 18.8 |
| 6 | 12.2 | 10.9 | 23.1 | 52.8 | 47.2 |
| 8 | 8.5 | 18.3 | 26.8 | 31.7 | 68.3 |
| 12 | 1.4 | 23.6 | 25.0 | 5.6 | 94.4 |
| 16 | - | 26.6 | 26.6 | 0 | 100 |
| 24 | - | 29.4 | 29.4 | 0 | 100 |

**Table 2.1. PHB/0.5% CB - First Melting Event (F1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 153.3 | 169.8 | 180.2 | 171.9 | *178.6* | 0.224 | *0.113* | 56.3 | 38.5 |
| 4 | 148.4 | 168.3 | 181.6 | 170.5 | *179.4* | 0.380 | *0.075* | 61.5 | 42.1 |
| 6 | 146.3 | 168.3 | 182.3 | 171.1 | *179.8* | 0.502 | *0.157* | 65.1 | 44.6 |
| 8 | 146.7 | 169.6 | 184.1 | 171.5 | *181.0* | 0.616 | *0.117* | 60.7 | 41.6 |
| 12 | 141.7 | 167.9 | 184.5 | 170.7 | *181.1* | 0.807 | *0.147* | 67.0 | 45.9 |
| 16 | 137.8 | 169.9 | 187.6 | 172.4 | *182.8* | 1.009 | *0.217* | 50.8 | 34.8 |
| 24 | 133.7 | 169.7 | 190.5 | 172.8 | *183.9* | 1.183 | *0.319* | 62.9 | 43.1 |
| 32 | 130.1 | 170.0 | 195.1 | 172.8 | [185.5] | 1.578 | - | 61.7 | 42.3 |

**Table 2.2. PHB/0.5% CB - Second Melting Event (F2)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 154.7 | 166.6 | 172.6 | 159.5 | 169.8 | 0.585 | 0.424 | 66.8 | 45.7 |
| 4 | 148.2 | 168.6 | 175.3 | *159.9* | 171.1 | *0.162* | 0.526 | 62.5 | 42.8 |
| 6 | 142.9 | 168.4 | 175.0 | *159.5* | 171.2 | *0.211* | 0.747 | 66.9 | 45.8 |
| 8 | 145.2 | 168.3 | 179.1 | *160.4* | 171.9 | *0.258* | 0.761 | 61.9 | 42.4 |
| 12 | 144.8 | 168.2 | 178.5 | *160.2* | 171.4 | *0.363* | 1.050 | 63.8 | 43.7 |
| 16 | 149.0 | 169.9 | 182.1 | [161] | 172.9 | - | 1.336 | 49.4 | 33.8 |
| 24 | 145.7 | 170.0 | 186.0 | [162] | 173.3 | - | 1.643 | 55.0 | 37.7 |
| 32 | 131.7 | 169.5 | 187.8 | [163] | 173.7 | - | 1.713 | 59.2 | 40.6 |

**Table 2.3. PHB/0.5% CB - Melt Crystallization Event (C1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | 111.5 | 98.0 | 80.8 | 49.8 | 0.140 | 6.79 | 63.1 | 43.2 |
| 4 | 107.5 | 88.4 | 60.4 | 89.9 | 0.222 | 4.78 | 59.7 | 40.9 |
| 6 | 100.1 | 82.6 | 61.0 | 81.7 | 0.329 | 2.93 | 51.4 | 35.2 |
| 8 | 96.6 | 77.5 | 52.8 | 73.7 | 0.372 | 2.77 | 45.4 | 31.1 |
| 12 | 93.0 | 70.8 | 41.9 | 70.8 | 0.484 | 1.86 | 41.1 | 28.1 |
| 16 | 85.3 | 60.8 | 33.4 | 59.4 | 0.581 | 1.54 | 20.3 | 13.9 |
| 24 | 80.3 | 59.1 | 38.8 | 57.2 | 0.977 | 0.88 | 8.4 | 5.8 |
| 32 | - | - | - | - | - | - | - | - |

**Table 2.4. PHB/0.5% CB - Cold Crystallization Event (C2)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - | - |
| 12 | 51.5 | 58.2 | 65.2 | 58.9 | 1,647 | 0.55 | 1.2 | 0.8 |
| 16 | 49.3 | 61.1 | 71.4 | 61.5 | 1.526 | 0.72 | 9.5 | 6.5 |
| 24 | 52.1 | 68.0 | 83.7 | 67.9 | 1.719 | 0.65 | 21.1 | 14.5 |
| 32 | 59.8 | 77.6 | 94.9 | 77.9 | 1.838 | 0.55 | 26.6 | 18.2 |

**Table 2.5. PHB/0.5% CB - Comparison of Normalized Minor/Major Melting Peak Height**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ** (°C/min) | F1 | | F2 | | *c*minor/*c*major (F1) | *c*minor/*c*major (F2) |
| *c*major | *c*minor | *c*major | *c*minor |
| 2 | 0.224 | *0.113* | 0.424 | 0.585 | 0.50 | 1.38 |
| 4 | 0.380 | *0.075* | 0.526 | *0.162* | 0.20 | 0.31 |
| 6 | 0.502 | *0.157* | 0.747 | *0.211* | 0.31 | 0.28 |
| 8 | 0.616 | *0.117* | 0.761 | *0.258* | 0.19 | 0.34 |
| 12 | 0.807 | *0.147* | 1.050 | *0.363* | 0.18 | 0.35 |
| 16 | 1.009 | *0.217* | 1.336 | 0 | 0.22 | 0 |
| 24 | 1.183 | *0.319* | 1.643 | 0 | 0.27 | 0 |
| 32 | 1.578 | 0 | 1.713 | 0 | 0 | 0 |

**Table 2.6. PHB/0.5% CB - Comparison of Melt and Cold Crystallinity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **(°C/min) | *Xc* (C1) | *Xc*(C2) | *X*TOTAL | *Xc* (C1)/*X*TOTAL | *Xc* (C2)/*X*TOTAL |
| 2 | 43.2 | - | 43.2 | 100 | 0 |
| 4 | 40.9 | - | 40.9 | 100 | 0 |
| 6 | 35.2 | - | 35.2 | 100 | 0 |
| 8 | 31.1 | - | 31.1 | 100 | 0 |
| 12 | 28.1 | 0.8 | 28.9 | 97.2 | 2.8 |
| 16 | 13.9 | 6.5 | 20.4 | 68.1 | 31.9 |
| 24 | 5.8 | 14.5 | 20.3 | 28.6 | 71.4 |
| 32 | - | 18.2 | 18.2 | 0 | 100 |

**Table 3.1. PHB/1% CB - First Melting Event (F1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tpeak* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 153.2 | 170.0 | 180.1 | 172.3 | *178.8* | 0.231 | *0.079* | 60.9 | 41.7 |
| 4 | 150.9 | 169.6 | 180.9 | 172.5 | *179.5* | 0.440 | *0.031* | 63.9 | 43.8 |
| 6 | 147.8 | 167.4 | 181.6 | 171.2 | *179.7* | 0.451 | *0.151* | 69.0 | 46.6 |
| 8 | 145.6 | 169.5 | 183.1 | 172.8 | *180.6* | 0.683 | *0.042* | 66.7 | 45.7 |
| 12 | 142.3 | 167.7 | 185.8 | 169.5 | *181.6* | 0.776 | *0.202* | 64.8 | 44.4 |
| 16 | 141.7 | 168.3 | 185.7 | 172.3 | *182.4* | 0.952 | *0.108* | 60.7 | 41.6 |
| 24 | 137.6 | 169.7 | 190.5 | 173.5 | *183.3* | 1.201 | *0.256* | 66.1 | 45.3 |
| 32 | 138.5 | 170.5 | 192.8 | 172.3 | *185.9* | 1.644 | *0.341* | 57.2 | 39.2 |

**Table 3.2. PHB/1%CB - Second Melting Event (F2)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tpeak* | | *cmax* | | *Hm* | *Xc* |  |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |  |
| 2 | 153.1 | 167.8 | 172.0 | *157.6* | 169.2 | *0.665* | 0.368 | 60.9 | 41.7 | ★ |
| 4 | 153.0 | 168.8 | 174.9 | *159.3* | 171.0 | *0.146* | 0.552 | 63.9 | 43.8 |  |
| 6 | 152.5 | 168.6 | 174.5 | *159.5* | 170.8 | *0.183* | 0.774 | 68.0 | 46.6 |  |
| 8 | 146.7 | 169.1 | 178.8 | *160.7* | 172.2 | *0.209* | 0.761 | 66.7 | 45.7 |  |
| 12 | 143.2 | 168.8 | 179.1 | [160] | 171.9 | - | 1.059 | 64.8 | 44.4 |  |
| 16 | 146.9 | 169.9 | 182.6 | [161] | 172.9 | - | 1.254 | 60.7 | 41.6 |  |
| 24 | 147.6 | 171.3 | 187.1 | [162] | 174.4 | - | 1.470 | 66.1 | 45.3 |  |
| 32 | 152.1 | 171.3 | 187.8 | [165] | 174.3 | - | 1.937 | 57.2 | 39.2 |  |

**Table 3.3. PHB/1% CB - Melt Crystallization Event (C1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | 100,6 | 87.5 | 68.5 | 87.2 | 0.140 | 6.60 | 65.4 | 44.8 |
| 4 | 105.2 | 86.1 | 66.5 | 85.8 | 0.257 | 4.79 | 61.8 | 42.3 |
| 6 | 101.0 | 79.7 | 54.5 | 78.6 | 0.276 | 3.57 | 55.1 | 37.7 |
| 8 | 97.8 | 72.8 | 41.2 | 62.2 | 0.311 | 3.13 | 44.0 | 30.2 |
| 12 | 87.4 | 64.6 | 38.5 | 64.1 | 0.444 | 1.90 | 24.4 | 16.7 |
| 16 | 78.6 | 58.8 | 37.5 | 57.9 | 0.666 | 1.24 | 9.5 | 6.5 |
| 24 | - | - | - | - | - | - | - | - |
| 32 | - | - | - | - | - | - | - | - |

**Table 3.4. PHB/1% CB - Cold Crystallization Event (C2)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - | - |
| 8 | 46.3 | 55.0 | 63.5 | 55.9 | 0.879 | 1.08 | 2.5 | 1.7 |
| 12 | 48.5 | 61.7 | 72.6 | 62.9 | 1.067 | 1.10 | 12.1 | 8.3 |
| 16 | 52.1 | 67.8 | 79.9 | 68.4 | 1.280 | 0.97 | 22.1 | 15.1 |
| 24 | 59.1 | 79.0 | 101.4 | 78.7 | 1.422 | 0.81 | 41.3 | 28.3 |
| 32 | 66.9 | 87.4 | 105.7 | 87.4 | 1.621 | 0.63 | 32.2 | 22.0 |

**Table 3.5. PHB/1% CB - Comparison of Normalized Minor/Major Melting Peak Height**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ** (°C/min) | F1 | | F2 | | *c*minor/*c*major (F1) | *c*minor/*c*major (F2) |
| *c*major | *c*minor | *c*major | *c*minor |
| 2 | 0.231 | *0.079* | 0.368 | *0.665* | 0.34 | 1.81 |
| 4 | 0.440 | *0.031* | 0.552 | *0.146* | 0.07 | 0.26 |
| 6 | 0.451 | *0.151* | 0.774 | *0.183* | 0.33 | 0.24 |
| 8 | 0.683 | *0.042* | 0.761 | *0.209* | 0.06 | 0.27 |
| 12 | 0.776 | *0.202* | 1.059 | - | 0.26 | 0 |
| 16 | 0.952 | *0.108* | 1.254 | - | 0.11 | 0 |
| 24 | 1.201 | *0.256* | 1.470 | - | 0.21 | 0 |
| 32 | 1.644 | *0.341* | 1.937 | - | 0.21 | 0 |

**Table 3.6. PHB/1% CB - Comparison of Melt and Cold Crystallinity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ** | *Xc* (C1) | *Xc*(C2) | *X*TOTAL | *Xc* (C1)/*X*TOTAL | *Xc* (C2)/*X*TOTAL |
| (°C/min) | (%) | (%) | (%) | (%) | (%) |
| 2 | 44.8 | - | 44.8 | 100 | 0 |
| 4 | 42.3 | - | 42.3 | 100 | 0 |
| 6 | 37.7 | - | 37.7 | 100 | 0 |
| 8 | 30.2 | 1.7 | 31,9 | 94,7 | 5,3 |
| 12 | 16.7 | 8.3 | 25,0 | 66,8 | 33,2 |
| 16 | 6.5 | 15.1 | 21,6 | 30,1 | 69,9 |
| 24 | - | 28.3 | 28,3 | 0 | 100 |
| 32 | - | 22.0 | 22.0 | 0 | 100 |

**Table 4.1. PHB/5% CB - First Melting Event (F1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tpeak* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 153.5 | 169.6 | 180.4 | 170.8 | *178.8* | 0.184 | *0.100* | 55.9 | 38.3 |
| 4 | 146.5 | 168.7 | 182.4 | 171.1 | *179,5* | 0.287 | *0.142* | 62.5 | 42.8 |
| 6 | 144.4 | 168.5 | 184.2 | 171.9 | *180.1* | 0.409 | *0.193* | 63.6 | 43.6 |
| 8 | 139.5 | 167.5 | 183.8 | 168.9 | *180.4* | 0.516 | *0.217* | 66.2 | 45.3 |
| 12 | 135.3 | 166.9 | 185.5 | 168.7 | *181.4* | 0.744 | *0.282* | 69.0 | 47.3 |
| 16 | 143.7 | 166.9 | 186.7 | 167.6 | *181.6* | 0.951 | *0.391* | 65.9 | 45.1 |
| 24 | 144.0 | 170.1 | 195.6 | 171.2 | *184.4* | 1.229 | *0.484* | 53.3 | 36.5 |
| 32 | 134.7 | 171.9 | 196.1 | 173.0 | *186.7* | 1.261 | *0.589* | 58.5 | 40.1 |

**Table 4.2. PHB/5%CB - Second Melting Event (F2)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tpeak* | | *cmax* | | *Hm* | *Xc* |  |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |  |
| 2 | 153.5 | 168.0 | 172.8 | *159.3* | 170.0 | *0.580* | 0.419 | 66.8 | 45.8 | ★ |
| 4 | 150.4 | 169.0 | 175.7 | *160.3* | 171.5 | *0.187* | 0.518 | 61.3 | 42.0 |  |
| 6 | 146.9 | 168.7 | 176.7 | *160.8* | 172.0 | *0.254* | 0.613 | 61.6 | 42.2 |  |
| 8 | 147.8 | 168.4 | 176.9 | *160.2* | 171.2 | *0.313* | 0.819 | 60.9 | 41.7 |  |
| 12 | 139.0 | 167.9 | 178.8 | *160.7* | 171.9 | *0.407* | 0.968 | 66.0 | 45.2 |  |
| 16 | 144.8 | 167.6 | 178.5 | *161.0* | 170.9 | *0.521* | 1.316 | 64.4 | 44.1 |  |
| 24 | 146.9 | 169.7 | 184.6 | [162] | 172.9 | - | 1.661 | 50.1 | 34.3 |  |
| 32 | 149.7 | 171.9 | 190.6 | [164] | 175.0 | - | 1.904 | 50.9 | 34.9 |  |

**Table 4.3. PHB/5% CB - Melt Crystallization Event (C1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | 113.2 | 96.6 | 80.6 | 96.3 | 0.153 | 8.31 | 62.2 | 42.6 |
| 4 | 106.6 | 90.6 | 72.4 | 89.8 | 0.296 | 4.04 | 58.6 | 40.1 |
| 6 | 104.2 | 86.5 | 64.8 | 85.7 | 0.395 | 2.98 | 52.0 | 35.6 |
| 8 | 99.0 | 81.3 | 55.5 | 81.2 | 0.437 | 2.24 | 48.1 | 32.9 |
| 12 | 95.4 | 74.2 | 50.3 | 73.6 | 0.565 | 1.78 | 44.6 | 30.6 |
| 16 | 91.6 | 67.8 | 41.4 | 67.2 | 0.628 | 1.49 | 38.3 | 26.2 |
| 24 | 81.4 | 60.0 | 40.3 | 57.4 | 0.996 | 0,89 | 11.0 | 7.6 |
| 32 | 75.5 | 61.8 | 50.4 | 61.2 | 1.754 | 0.45 | 2.7 | 1.8 |

**Table 4.4. PHB/5% CB - Cold Crystallization Event (C2)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - | - |
| 12 | - | - | - | - | - | - | - | - |
| 16 | 50.9 | 59.8 | 66.9 | 61.2 | 1.796 | 0.56 | 2.2 | 1.5 |
| 24 | 52.5 | 66.6 | 79.8 | 67.0 | 1.829 | 0.58 | 12.4 | 8.5 |
| 32 | 57.4 | 75.7 | 92.5 | 75.9 | 1.940 | 0.56 | 20.6 | 14.1 |

**Table 4.5. PHB/5% CB - Comparison of Normalized Minor/Major Melting Peak Height**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ** (°C/min) | F1 | | F2 | | *c*minor/*c*major (F1) | *c*minor/*c*major (F2) |
| *c*major | *c*minor | *c*major | *c*minor |
| 2 | 0.184 | *0.100* | 0.419 | 0.580 | 0.54 | 1.38 |
| 4 | 0.287 | *0.142* | 0.518 | 0.187 | 0.49 | 0.36 |
| 6 | 0.409 | *0.193* | 0.613 | 0.254 | 0.47 | 0.41 |
| 8 | 0.516 | *0.217* | 0.819 | 0.313 | 0.42 | 0.38 |
| 12 | 0.744 | *0.282* | 0.968 | 0.407 | 0.38 | 0.42 |
| 16 | 0.951 | *0.391* | 1.316 | 0.521 | 0.41 | 0.40 |
| 24 | 1.229 | *0.484* | 1.661 | - | 0.39 | 0 |
| 32 | 1.261 | *0.589* | 1.904 | - | 0.47 | 0 |

**Table 4.6. PHB/5% CB - Comparison of Melt and Cold Crystallinity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ** | *Xc* (C1) | *Xc*(C2) | *X*TOTAL | *Xc* (C1)/*X*TOTAL | *Xc* (C2)/*X*TOTAL |
| (°C/min) | (%) | (%) | (%) | (%) | (%) |
| 2 | 42.6 | - | 42.6 | 100 | 0 |
| 4 | 40.1 | - | 40.1 | 100 | 0 |
| 6 | 35.6 | - | 35.6 | 100 | 0 |
| 8 | 32.9 | - | 32.9 | 100 | 0 |
| 12 | 30.6 | - | 30.6 | 100 | 0 |
| 16 | 26.2 | 1.5 | 27,7 | 94,6 | 5,4 |
| 24 | 7.6 | 8.5 | 16,1 | 47,2 | 52,8 |
| 32 | 1.8 | 14.1 | 15,9 | 11,3 | 88,7 |

**Table 5.1. PHB/10% CB - First Melting Event (F1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 156.3 | 170.3 | 181.0 | 172.5 | *179.4* | 0.254 | *0.037* | 47.6 | 32.6 |
| 4 | 157.9 | 169.7 | 181.7 | 172.3 | *180.0* | 0.430 | *0.056* | 53.7 | 36.8 |
| 6 | 144.2 | 168.7 | 183.9 | 172.2 | *180.5* | 0.500 | *0.080* | 62.8 | 43.0 |
| 8 | 144.5 | 168.0 | 184.1 | 171.2 | *180.9* | 0.598 | *0.085* | 65.2 | 44.6 |
| 12 | 137.5 | 168.0 | 184.9 | 171.6 | *182.0* | 0.751 | *0.091* | 66.1 | 45.3 |
| 16 | 138.1 | 169.1 | 186.7 | 173.2 | *183.0* | 0.910 | *0.108* | 61.9 | 42.4 |
| 24 | 139.2 | 168.3 | 190.6 | 171.5 | *184.0* | 1.291 | *0.236* | 68.6 | 47.0 |
| 32 | 138.5 | 171.1 | 195.8 | 173.5 | [186] | 1.563 | - | 58.2 | 39.9 |

**Table 5.2. PHB/10%CB - Second Melting Event (F2)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tmp* | | *cmax* | | *Hm* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | | (min1) | | (J/g) | (%) |
| 2 | 154.6 | 168.2 | 173.0 | *160.5* | 170.2 | *0.558* | 0.447 | 57.4 | 39.3 |
| 4 | 148.8 | 168.8 | 175.3 | *161.5* | 171.8 | *0.230* | 0.475 | 58.7 | 40.2 |
| 6 | 147.7 | 168.5 | 177.4 | *161.5* | 172.0 | *0.309* | 0.608 | 61.6 | 42.2 |
| 8 | 142.8 | 167.7 | 176.6 | *161.2* | 171.5 | *0.370* | 0.731 | 68.4 | 46.8 |
| 12 | 142.3 | 168.1 | 180.6 | *161.2* | 172.0 | *0.458* | 0.914 | 64.3 | 44.0 |
| 16 | 142.5 | 169.7 | 186.1 | *164.3* | 173.8 | *0.547* | 1.035 | 61.2 | 41.9 |
| 24 | 142.8 | 168.6 | 184.2 | [162] | 172.5 | - | 1.555 | 66.1 | 45.3 |
| 32 | 152.3 | 172.0 | 188.0 | [163] | 174.6 | - | 2.003 | 45.3 | 31.0 |

**Table 5.3. PHB/10% CB - Melt Crystallization Event (C1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | 113.6 | 102.4 | 87.7 | 102.4 | 0.193 | 5.63 | 57.3 | 39.3 |
| 4 | 109.5 | 96.0 | 77.9 | 95.3 | 0.332 | 3.40 | 58.6 | 40.1 |
| 6 | 105.1 | 90.5 | 68.3 | 89.7 | 0.440 | 2.47 | 58.2 | 39.9 |
| 8 | 103.3 | 87.1 | 74.0 | 86.4 | 0.602 | 2.05 | 53.8 | 36.8 |
| 12 | 97.1 | 77.4 | 56.8 | 76.5 | 0.676 | 1.66 | 49.0 | 33.5 |
| 16 | 94.0 | 72.4 | 46.7 | 71.9 | 0.774 | 1.36 | 45.9 | 31.5 |
| 24 | 88.8 | 64.2 | 40.4 | 63.7 | 0.963 | 1.03 | 34.4 | 23.6 |
| 32 | 79.0 | 58.4 | 41.6 | 58.0 | 1.284 | 0.67 | 13.7 | 9.4 |

**Table 5.4. PHB/10% CB - Cold Crystallization Event (C2)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ** | *T*0.1% | *T*50% | *T*99.9% | *Tc* | *cmax* | **½ | *Hc* | *Xc* |
| (°C/min) | (°C) | (°C) | (°C) | (°C) | (min1) | (min) | (J/g) | (%) |
| 2 | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - | - | - |
| 12 | - | - | - | - | - | - | - | - |
| 16 | - | - | - | - | - | - | - | - |
| 24 | 50.1 | 61.0 | 72.4 | 62.2 | 2.157 | 0.46 | 3.6 | 2.5 |
| 32 | 54.7 | 68.7 | 81.1 | 69.1 | 2.395 | 0.43 | 8.9 | 6.1 |

**Table 5.5. PHB/10% CB - Comparison of Normalized Minor/Major Melting Peak Height**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ** (°C/min) | F1 | | F2 | | *c*minor/*c*major (F1) | *c*minor/*c*major (F2) |
| *c*major | *c*minor | *c*major | *c*minor |
| 2 | 0.254 | *0.037* | 0.447 | *0.558* | 0.15 | 1.25 |
| 4 | 0.430 | *0.056* | 0.475 | *0.230* | 0.13 | 0.48 |
| 6 | 0.500 | *0.080* | 0.608 | *0.309* | 0.16 | 0.51 |
| 8 | 0.598 | *0.085* | 0.731 | *0.370* | 0.14 | 0.51 |
| 12 | 0.751 | *0.091* | 0.914 | *0.458* | 0.12 | 0.50 |
| 16 | 0.910 | *0.108* | 1.035 | *0.547* | 0.12 | 0.53 |
| 24 | 1.291 | *0.236* | 1.555 | - | 0.18 | 0 |
| 32 | 1.563 | - | 2.003 | - | 0 | 0 |

**Table 5.6. PHB/10% CB - Comparison of Melt and Cold Crystallinity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **(°C/min) | *Xc* (C1) | *Xc*(C2) | *X*TOTAL | *Xc* (C1)/*X*TOTAL | *Xc* (C2)/*X*TOTAL |
| 2 | 39.3 | - | 39.3 | 100 | 0 |
| 4 | 40.1 | - | 40.1 | 100 | 0 |
| 6 | 39.9 | - | 39.9 | 100 | 0 |
| 8 | 36.8 | - | 36.8 | 100 | 0 |
| 12 | 33.5 | - | 33.5 | 100 | 0 |
| 16 | 31.5 | - | 31.5 | 100 | 0 |
| 24 | 23.6 | 2.5 | 26.1 | 90.4 | 9.6 |
| 32 | 9.4 | 6.1 | 15.5 | 60.7 | 39.3 |