**Substantial size reduction of banana fibres and enhancement of fibre properties achieved through a single mechanical treatment**

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| --- | --- |
| C:\Users\User\Downloads\Screenshot_20210914-090408_Video Player.jpg  (a) | (b)  Measurement of internal space between Grinding Stone and Cover |

Figure showing: (a) Commercial Wet Grinder; (b) Illustration of the internal space that was varied in order to change the gap size between the grinding discs (Scale: 1:80)

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|  |

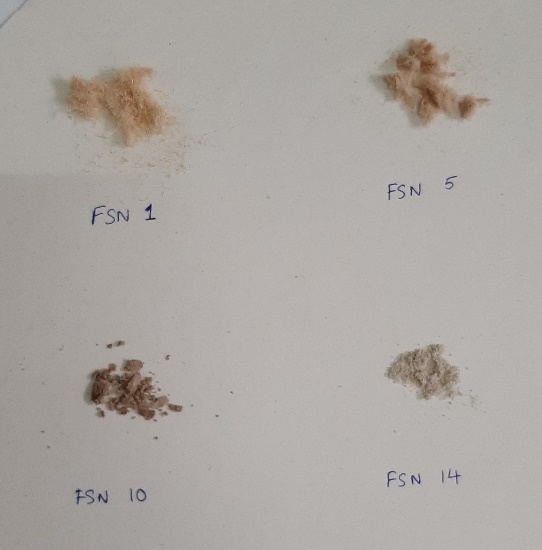
Figure showing the different locations on the sample holder at which SEM images were taken for each sample

**Fibre Diameter Distribution for all fibre samples**

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| --- | --- |
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Figures showing fibre diameter distribution for all ground fibre samples (FSN 1 to FSN 12) with x-axes giving the size ranges in microns and y-axes giving the number of diameter measurements made

**Using iodine solution to test whether the fibre samples contain starch:**

 Figure showing Fibre samples used for the iodine test

|  |  |
| --- | --- |
| C:\Users\User\Pictures\20220518_110153 (2).jpg  FSN 1 | C:\Users\User\Pictures\20220518_110201 (2).jpg  FSN 5 |
| C:\Users\User\Pictures\20220518_110211 (2).jpg  FSN 10 | C:\Users\User\Pictures\20220518_110218 (2).jpg  FSN 14 |

Figure showing fibre samples after iodine test: No blue-black colour determined. Thus, the fibres do not contain starch.

**FTIR Full Spectra**

|  |
| --- |
| C:\Users\User\Documents\OriginLab\Origin8\User Files\Graph01.jpg  (a) |
| C:\Users\User\Documents\OriginLab\Origin8\User Files\Graph02.jpg  (b) |
| C:\Users\User\Documents\OriginLab\Origin8\User Files\Graph03.jpg  (c)  Figure showing FTIR full spectra from 400 to 4000 cm-1 for: (a) FSN 1, 2, 3, 4, 5; (b) FSN 1, 6, 7, 8, 9, 10, 11, 12; (c) FSN 1, 13, 14 |

Table showing detailed XRD results for peaks at 2θ = 15° and 22°

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2θ(°)** | **FWHM** | **Peak Height** | **Imin** | **Peak Area** | **%Crystallinity** | **Crystallite Size (Å)** | **d-spacing (Å)** |
| FSN 1 | 15.88 | 5.62 | 25.72 | 15.82 | 136.02 | 61.08 | 14.91 | 5.58 |
| 22.34 | 3.99 | 40.65 | 178.06 | 21.21 | 3.98 |
| FSN 2 | 15.53 | 5.02 | 20.38 | 11.27 | 98.18 | 67.18 | 16.70 | 5.71 |
| 22.67 | 3.65 | 34.34 | 141.55 | 23.20 | 3.92 |
| FSN 3 | 15.65 | 4.90 | 19.57 | 12.29 | 94.51 | 65.31 | 17.11 | 5.66 |
| 22.46 | 3.84 | 35.42 | 151.24 | 22.06 | 3.96 |
| FSN 4 | 15.34 | 4.69 | 16.77 | 10.71 | 77.86 | 69.97 | 17.86 | 5.78 |
| 22.25 | 3.71 | 35.66 | 160.34 | 22.81 | 3.99 |
| FSN 5 | 16.16 | 4.65 | 11.00 | 7.01 | 47.73 | 71.80 | 18.04 | 5.48 |
| 22.54 | 3.58 | 24.86 | 97.48 | 23.67 | 3.94 |
| FSN 6 | 15.14 | 4.97 | 18.61 | 11.24 | 89.37 | 67.40 | 16.85 | 5.85 |
| 22.48 | 3.65 | 34.47 | 143.07 | 23.19 | 3.95 |
| FSN 7 | 15.61 | 5.00 | 16.12 | 9.30 | 77.34 | 65.58 | 16.77 | 5.68 |
| 22.16 | 3.91 | 27.03 | 106.97 | 21.63 | 4.01 |
| FSN 8 | 15.57 | 4.48 | 17.92 | 11.12 | 78.58 | 67.22 | 18.70 | 5.69 |
| 22.52 | 3.84 | 33.93 | 144.80 | 22.04 | 3.95 |
| FSN 9 | 15.16 | 4.57 | 14.45 | 8.25 | 63.43 | 74.30 | 18.32 | 5.84 |
| 22.58 | 3.33 | 32.10 | 123.81 | 25.42 | 3.94 |
| FSN 10 | 14.80 | 3.90 | 8.19 | 4.19 | 29.05 | 78.12 | 21.49 | 5.99 |
| 22.40 | 3.38 | 19.15 | 71.96 | 25.05 | 3.97 |
| FSN 11 | 14.86 | 2.92 | 7.45 | 3.38 | 19.33 | 80.20 | 28.64 | 5.96 |
| 22.36 | 3.13 | 17.08 | 61.22 | 27.05 | 3.98 |
| FSN 12 | 14.84 | 3.66 | 8.24 | 4.38 | 26.70 | 76.44 | 22.86 | 5.97 |
| 22.30 | 3.23 | 18.59 | 67.85 | 26.18 | 3.99 |

Table showing detailed results for peaks at 2θ values of corundum material

|  | **2θ (°)** | **FWHM** | **Peak Height** | **Peak Area** | **Average Peak Height** | **Average Peak Area** |
| --- | --- | --- | --- | --- | --- | --- |
| FSN 1 | - | - | - | - | - | - |
| FSN 2 | 43.65 | 0.57 | 9.55 | 7.38 | 9.55 | 7.38 |
| FSN 3 | 25.21 | 0.67 | 16.21 | 8.32 | 10.05 | 7.94 |
| 34.94 | 1.79 | 10.42 | 15.06 |
| 57.47 | 0.09 | 3.51 | 0.44 |
| FSN 4 | 34.76 | 2.76 | 9.42 | 22.18 | 6.34 | 11.25 |
| 43.84 | 1.97 | 6.45 | 10.44 |
| 57.75 | 0.29 | 3.15 | 1.11 |
| FSN 5 | 25.57 | 1.42 | 11.48 | 13.80 | 7.67 | 10.14 |
| 35.31 | 2.17 | 11.89 | 18.14 |
| 37.83 | 1.75 | 6.80 | 9.96 |
| 43.26 | 1.66 | 8.54 | 11.48 |
| 52.65 | 0.84 | 3.30 | 3.24 |
| 57.55 | 1.05 | 4.00 | 4.21 |
| FSN 6 | - | - | - | - | - | - |
| FSN 7 | - | - | - | - | - | - |
| FSN 8 | 25.92 | 0.85 | 12.14 | 9.35 | 7.95 | 9.89 |
| 35.01 | 2.42 | 9.98 | 20.99 |
| 43.99 | 1.24 | 6.92 | 7.24 |
| 57.75 | 0.22 | 2.76 | 2.00 |
| FSN 9 | 25.88 | 1.06 | 11.58 | 10.10 | 9.54 | 10.71 |
| 34.72 | 3.39 | 9.48 | 24.25 |
| 43.44 | 0.27 | 17.34 | 12.21 |
| 52.81 | 0.33 | 4.17 | 3.07 |
| 57.88 | 0.68 | 5.11 | 3.94 |
| FSN 10 | 25.51 | 0.73 | 12.24 | 7.58 | 10.03 | 8.48 |
| 35.07 | 0.65 | 15.24 | 17.21 |
| 37.85 | 0.64 | 8.55 | 6.22 |
| 43.32 | 0.72 | 12.54 | 11.57 |
| 52.39 | 0.52 | 4.58 | 3.25 |
| 57.33 | 0.65 | 7.06 | 5.04 |
| FSN 11 | 25.51 | 0.69 | 11.70 | 8.18 | 10.32 | 8.36 |
| 35.11 | 0.64 | 14.31 | 15.39 |
| 37.63 | 0.61 | 7.45 | 6.36 |
| 43.24 | 0.64 | 13.01 | 10.54 |
| 52.47 | 0.56 | 5.47 | 3.35 |
| 57.49 | 0.53 | 9.95 | 6.36 |
| FSN 12 | 25.47 | 0.45 | 16.35 | 9.63 | 13.13 | 9.54 |
| 35.05 | 0.48 | 17.83 | 16.57 |
| 37.71 | 0.51 | 8.77 | 7.44 |
| 43.22 | 0.52 | 17.62 | 12.93 |
| 52.39 | 0.44 | 5.99 | 3.48 |
| 57.37 | 0.52 | 12.18 | 7.16 |
| FSN 13 | 25.51 | 1.40 | 11.06 | 13.57 | 8.81 | 12.95 |
| 29.42 | 2.50 | 10.80 | 23.99 |
| 34.84 | 1.75 | 11.62 | 16.08 |
| 37.67 | 1.52 | 8.96 | 10.84 |
| 42.93 | 1.56 | 7.90 | 10.89 |
| 56.98 | 0.77 | 2.51 | 2.35 |
| FSN 14 | 25.55 | 1.83 | 11.57 | 17.71 | 8.96 | 13.28 |
| 35.21 | 2.44 | 12.58 | 21.99 |
| 43.38 | 1.63 | 7.98 | 10.82 |
| 57.47 | 0.61 | 3.72 | 2.61 |