**Cellulose nanofiber, Lignin, and Hemicellulose as value-added products from recycled Old Corrugated Box (OCB)**

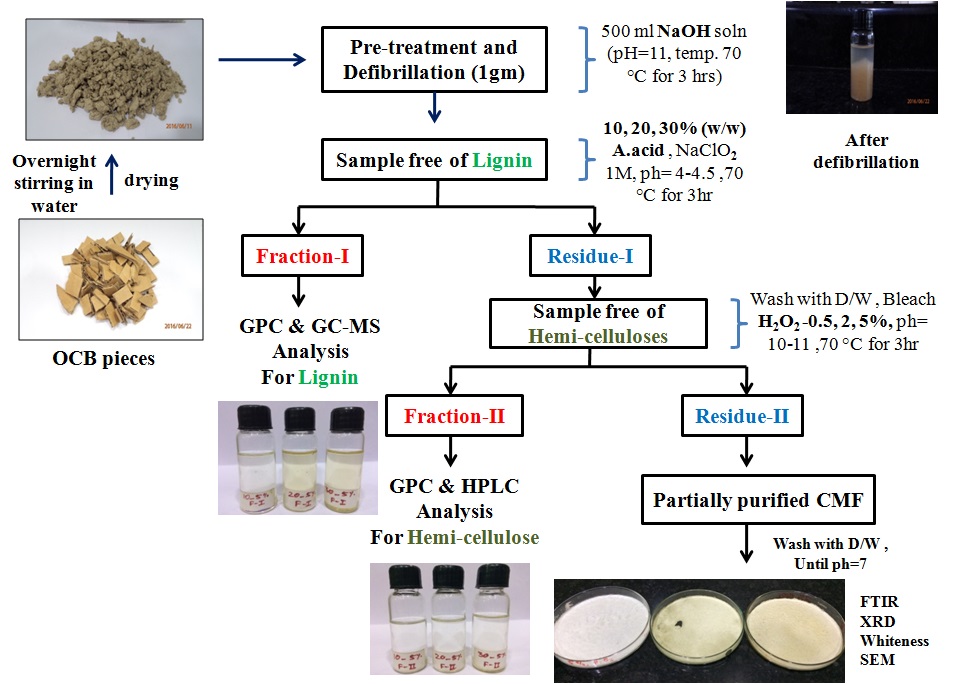
Sumit S. Lal, Ajit P. Patil, Ganesh A. Phalak and Shashank T. Mhaske

Department of Polymer and Surface Engineering,

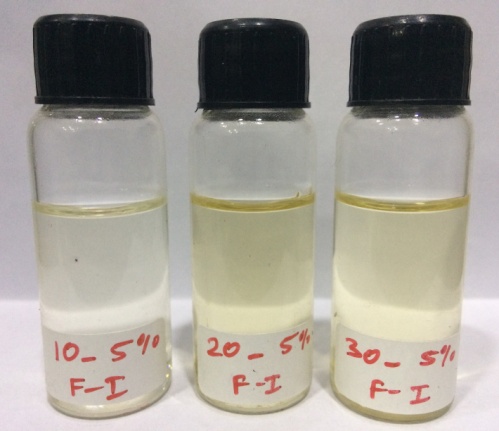
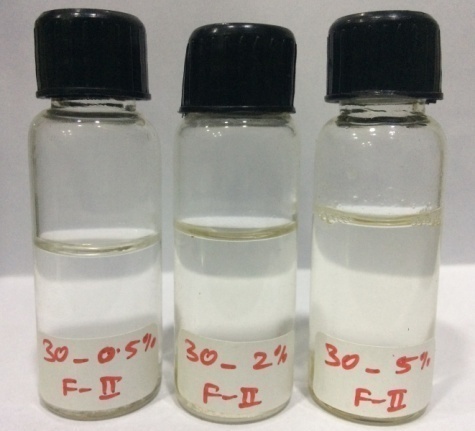
Institute of Chemical Technology (ICT), Matunga, Mumbai, India.

**Supplementary information (SI):**

**SI-I** Pre-treatment of OCB raw material:



**SI-II** Change in color of fractions collected after acetic acid and H2O2 pre-treatment:

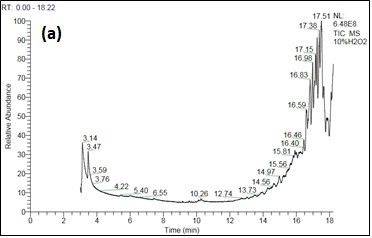
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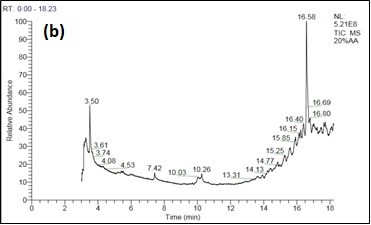
**SI-III** L\*a\*b\* color space value of OCB raw and H2O2 (0.5%, 2%, & 5%) treated OCB fibers:

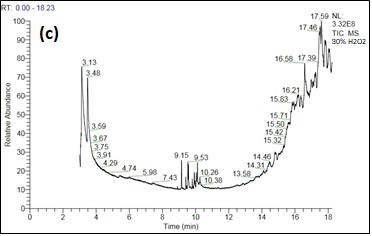
|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Percent reflectance | *ΔE* | *WI* |
| OCB raw | 25.45 | --- | 33.19 |
| Treated 0.5% | 47.85 | 4.13 | 57.29 |
| Treated 2% | 47.97 | 5.03 | 59.63 |
| Treated 5% | 44.60 | 4.20 | 54.76 |

*ΔE, color difference; WI, whiteness index*

**SI-IV** Total ion chromatogram of the (a) 10%, (b) 20% and (c) 30% acetic acid treated fraction-I:

****

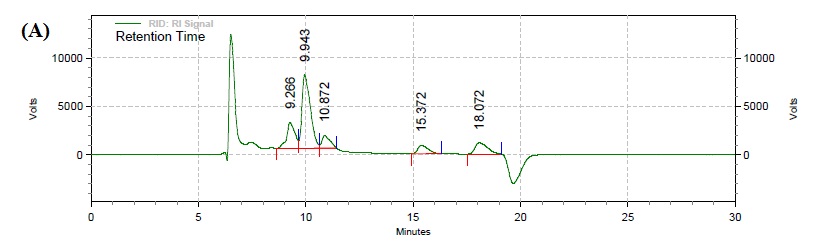
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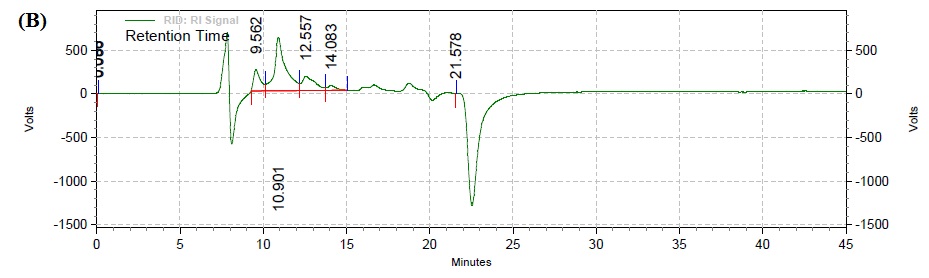
**SI-V** Total Lignin content in OCB Raw:

|  |  |  |
| --- | --- | --- |
| Sample | Lignin content  (%) | Lignin content  (Avg. %) |
| OCB Raw-01 | 23 | 28.15 (± 3.48) |
| OCB Raw-02 | 29.48 |
| OCB Raw-03 | 31.71 |
| OCB Raw-04 | 30.22 |
| OCB Raw-05 | 26.34 |

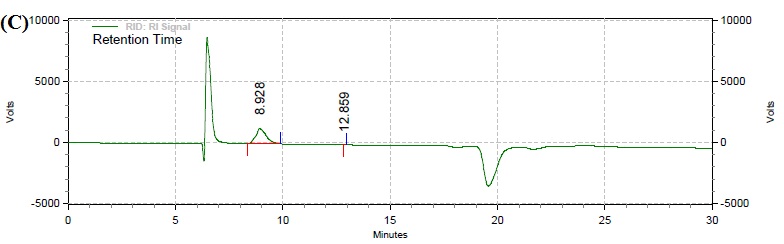
**SI-VI** HPLC analysis of hemicellulose fraction obtained after (a) 0.5%, (b) 2% and (c) 5% bleach treatment:



**(a)**



**(b)**



**(c)**

**SI –VII** Composition of known compounds with respect to standards in fraction-II after bleach treatment:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. No. | | H2O2 (%) | | Peaks | | Retention time (min) | | RT of known compound |
| 1 | | 0.5 | | 1 | | 9.26 | | ---- | |
|  | |  | | 2 | | 9.94 | | Glucose | |
|  | |  | | 3 | | 10.87 | | Arabinose | |
|  | |  | | 4 | | 15.37 | | ---- | |
|  | |  | | 5 | | 18.07 | | ---- | |
| 2 | | 2 | | 1 | | 9.56 | | Glucose | |
|  | |  | | 2 | | 10.90 | | Arabinose | |
|  | |  | | 3 | | 12.55 | | ---- | |
|  | |  | | 4 | | 14.08 | | Xylose | |
|  | |  | | 5 | | 21.57 | | ---- | |
| 3 | | 5 | | 1 | | 8.92 | | ---- | |
|  | |  | | 2 | | 12.85 | | ---- | |