Reviewer 4: comments and Suggestions for Authors

The manuscript is very well written and describes the extraction of purified cellulose from a plant of the cactus family and the characterization of the obtained material by SEM, thermal analysis, FTIR and NMR. I have only a few points that must be addressed by the authors.

Reply: Thanks to the referee comments. Several points in the manuscript was modified to better understanding of this study. Correction of the language was done. The change is highlighted in the yellow in the manuscript text”.

1. Line 92. I guess you mean “pestle and mortar”;?
Reply: Thanks to the referee comments. The text has been rewritten.

2. Maybe “retentate” instead of “filtrate”?
Reply: Thanks to the referee comments. The text has been rewritten.

3. Lines 116 & 117. “initial” instead of “inicial”;
Reply: Thanks to the referee comments. The text has been rewritten.

4. Line 129. Why did you perform TG under air flow while DSC was under nitrogen gas?
Reply: Thanks to the referee comments. The methodology was inadequately described. The change is highlighted in the yellow text.

The TG curves were obtained using a thermogravimetric module (Q600, TA-Instruments, USA). 4.0 mg of sample was weighed on alumina crucible and heated up to 600 °C under a nitrogen atmosphere with a flow of 50 mL.min⁻¹ as purge gas and a heating rate of 10 °C.min⁻¹.

5. Line 153 and some other parts. Opuntia ficus-indica is written in italic up to this line. I guess this is the plant’s species name.
Reply: Thanks, the term was standardized as Opuntia ficus-indica L. Miller in all manuscript

Reply: Thanks to the referee comments. The text has been rewritten.

7. Line 168. I wonder why the error is stated with 3 significant figures. Usually it requires one significant figure or two when the leading number is 1 or 2.

Reply: We agreed with the suggestion. The text has been rewritten (11.69 ± 2.5%).

8. Lines 226 & 229. The cited references are not numbered. Jabli et al. is not even listed in the references.

Reply: Thank you, sorry for the mistake. References have been added.

9. The discussion concerning XRD needs some revision. From my understanding, the cellulose spectrum shows peaks corresponding to cellulose II crystalline structure (specifically the lump around 2θ=12 and the small shoulder just above 2θ=20) while holocellulose spectrum shows cellulose I peaks (the most intense one and the lump at about 2θ=16). This is because the last chemical treatment with KOH at 24% was concentrated enough to cause crystalline structure change. Please elaborate on that.

Reply: We would like to thank the reviewer for the opportunity of improve the results interpretation. Please, see the changes below.

Figure 5 presents the X-ray diffractograms of holocellulose and cellulose, whose diffraction patterns characterize the structural modifications that occurred from holocellulose to cellulose. The X-ray diffraction patterns are typical of semicrystalline materials:

Holocellulose diffractogram presents peaks at 2θ = 12.5, 15.6, 21.3, 22, 26.5 and 34.4, while cellulose diffractogram shows peaks at 2θ = 12, 20, 21.2, 23.6 and 26. Previous studies have demonstrated that the diffractogram peaks for holocellulose are similar to those for cellulose I as the former is a mixture of cellulose and hemicelluloses [40, 41]. In addition, the cellulose diffractogram reveals that it belongs to class II, as demonstrated by Astruc and colaborators (2017) [42]. The modification of the cellulose structure might have occurred due to the highly concentrated alkaline treatment (KOH solution at 24% (w/v)) [43], which causes swelling and consequently the weakening of the molecular bonds, resulting in recrystallization of the cellulose fibers [44].

Besides that, broad and diffuse peaks characteristic of amorphous regions are observed in 2θ = 12.1 and 15.6 for cellulose and holocellulose, respectively. However, after hemicellulose removal, intense and narrow peaks in 2θ = 26.5 appears which relates to crystalline regions attributed to cellulose. In addition, the diffractograms show high intensity peaks at 2θ = 22 (holocellulose) and 21.4 (cellulose) that characterize semicrystalline regions.

Similar diffraction profiles were observed by Jabli et al., (2018) [45], in which the authors assigned the broad peaks around 2θ = 15 to amorphous regions, whereas those of greater intensity, which appeared around 2θ = 22, they attributed to the presence of crystalline regions.
within the polymer structure. According to Zhang et al. (2018) [46], these peaks around $2\theta = 22$ correspond to the packaging of the polymer chains by Van der Walls forces, which are common to most polymeric materials.

The crystalline index revealed a 64% of crystallinity for holocellulose, which is similar to those found for holocellulose extracted from flax stem, rose stems and banana peels [42, 47-48]. However, crystalline index of cellulose II was 83%, which was better than that obtained for cellulose II extracted from sago seed shells, sugarcane bagasse,alfa fibers and red algae waste [44, 49].