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Characterisation of glass polishing waste samples

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Abstract

The present work describes the characterisation of the two different polishing waste samples. The samples were analysed with laser particle size analyser, XRD, XRF, TGA, and SEM. In the sample A, a large amount of calcite ($CaCO_3$) together with silica and alumino-silicates were observed with SEM. In the minerology, only $CaCO_3$, CeO_2 and $LnO_{0.65}F_{1.7}$ were found. In the sample B, very small amounts of impurities (<2%) were found. The particle size of sample B was decreased compared to it's original polishing powder. CeO_2 and $LnO_{0.65}F_{1.7}$ compounds were found in the XRD analysis.

Introduction

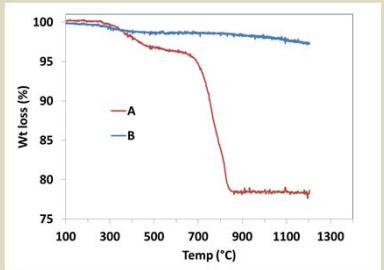
Ceria is the principal compound in glass polishing powder because of its chemical and mechanical properties. After several cycles of polishing, this powder either enriches with impurities (glass, flocculants etc.) or changes its particle size distribution. Hence, it can't be further used due to poor polishing properties and ends up in landfills. The present work describes the characterisation of the two different polishing waste samples, which will help in designing the subsequent recovery processes.

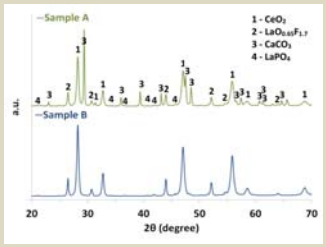
Methods and Materials

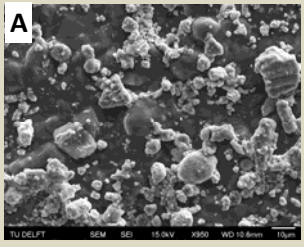
- Two glass polishing waste samples
- XRF – Chemical analysis
- TGA – Thermal analysis
- XRD – Mineralogy
- SEM – Morphology and mineralogy
- LD – Particle size distribution

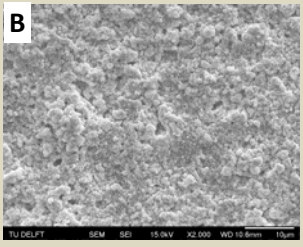
Results and Discussion

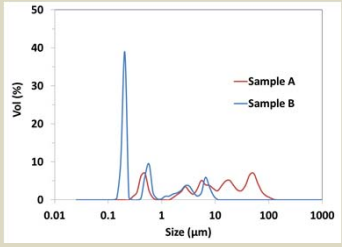
(wt. %)	A	B
CeO_2	22.1	55.3
La_2O_3	12.7	29.5
F	3.2	8.3
SiO_2	5.7	0.4
Al_2O_3	4.3	-
CaO	27.9	0.2
Fe_2O_3	0.4	0.7
P_2O_5	0.8	2.2
LOI	21.5	1.7











Conclusions

- Sample B contains very less impurities where sample A contains high amount of impurities.
- Sample B contains compounds of CeO_2, $LaO_{0.65}F_{1.7}$ and $LaPO_4$.
- Sample A contains compounds of CeO_2, $CaCO_3$, $LaO_{0.65}F_{1.7}$ and $LaPO_4$ together with silica and alumino-silicates
- Sample B is fine material compared to sample A

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