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Comparison of the manufacture embodied energy of phosphate glasses produced through sol-gel and melt quenching methods

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Introduction

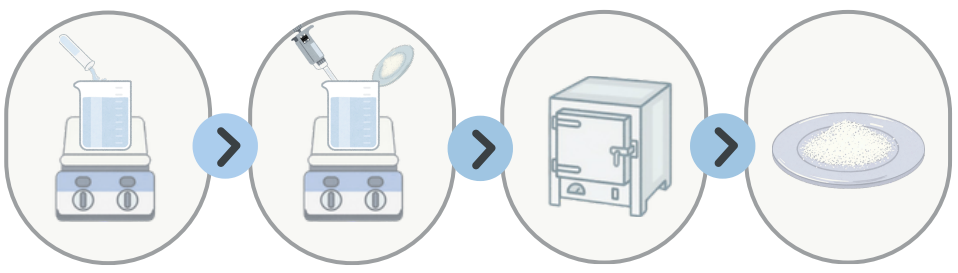
Sol-gel processes in glass making are considered to have less impact on the environment due to the lower temperatures employed, compared to melt quenching methods.

Objectives

Compare the total embodied energy of phosphate glass made by its literature sol-gel route, an adapted route and a comparison to a melt quench route.

Methodology

- Sol-Gel Method



- Melt Quenching Method

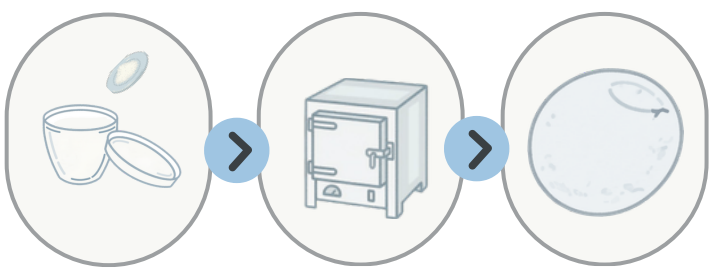
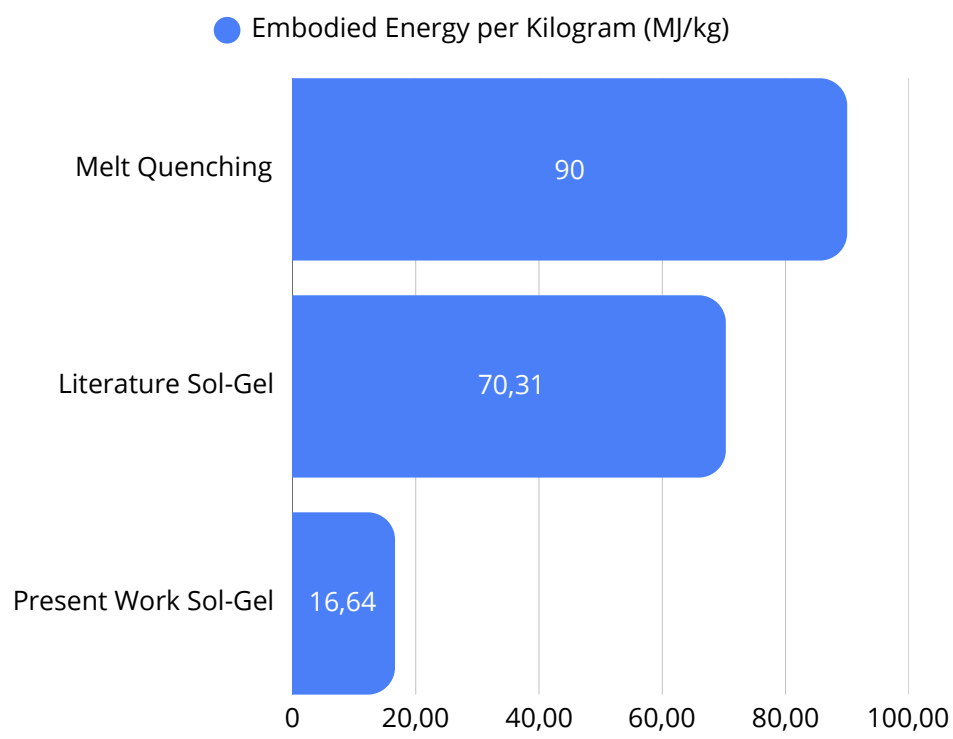


Table 1. Embodied energy calculation parameters for the different processes

Method	Total Time (hours)	Temperature (°C)	Furnace Power (W)
Melt Quenching	1	1050	7000
Literature Sol-Gel	153	400	3
Present Work Sol-Gel	33	300	3

Results



- Embodied energy of glass produced in a laboratory environment;
- For industrial scale, melt-quenching becomes more efficient.

Conclusions

- From a manufacture point of view, the sol-gel method is more energy efficient;
- The manufacture improvements were succesful in reducing energy for the present works' method;
- A full life cycle assessment of the process is a natural and important next step.

Acknowledgements

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