Glass-based coating and joining materials for energy conversion and storage systems

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A critical aspect for the success of thermoelectric (TE) materials in waste heat recovery is their stability and oxidation resistance over time at high temperatures (up to 600 °C). Glass-based materials with low electrical and thermal conductivity, thanks to the versatility of compositions and properties, are excellent candidates as low cost protective coatings. The deposition of oxidation-resistant glass-ceramic coatings is a viable and effective method to overcome the main drawback of oxidation and can further extend the temperature range for thermoelectric applications.

In this work, new silica-based glasses and glass-ceramics, which were specifically designed as oxidation protective coatings (up to 600°C) for TE materials such as higher manganese silicide (HMS), magnesium silicide (Sn and Sb doped) and TiO_x are presented and discussed.

Furthermore, within the Horizon 2020 project SOLSTICE[1], two different Na-Zn molten salt batteries are currently being developed. The joining of similar and dissimilar materials is central for cell lifetime and safe operation. Glasses and glass-ceramics can offer several advantages, including hermeticity, possible self-healing by viscous flow of the residual glassy phase at medium-high temperatures, tailorable coefficient of thermal expansion (CTE) and the possibility to avoid the use of pressure. The development of new glass-ceramic sealing processes for Na-Zn batteries will also be presented.

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[1] https://www.solstice-battery.eu