Binary System of Molten Salts for Industrial Process Heating

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Why industrial process heat at 200 ºC?

- Industrial sector accounts for 20% of the final energy demand;
- Heat is responsible for 70% of final energy demand in industry;
- Among the industrial consumption, over 30% is low temperature process;
- 75-85% of all process heating, cooling and inter-process heat transfer applications take place in the temperature range from ambient up to 200 ºC;
- All of the heating processes come with surplus heat.

My research purpose

Latent heat storage by Phase Change Materials (PCMs) with melting temperatures around 200 ºC to meet the discrepancy between the heat supply and heat demand in industrial process heating.

Tasks:

1.Selection of heat storage media

2.Heat storage system design

3.Heat charging and discharging analysis

4.Improvement of the heat exchange

Binary system of molten salts

Compound	Melting temperature ◦C	Latent heat kJ/kg	Thermal conductivity W/m^{2}K	Density Kg/m^3
$LiNO_3$+$NaNO_3$ 0.57+0.43	193	248		
$LiNO_3$+$NaNO_3$ 0.49+0.51	194	265		
$LiNO_3$+NaCl 0.87+0.13	208	369	0.7	2355

1. Thermal properties: melting temperature, latent heat; thermal conductivity and viscosity;
2. Thermal stability: short term and long term;
3. Corrosion to copper and stainless steel.

Thermal property

- Melting temperature

  ----Differential Scanning Calorimeter (DSC)

- Latent heat

  ----DSC

- Thermal conductivity

  ----Xenon Flash thermal diffusivity meter

- Viscosity

  ----Rheometer

Thermal stability

- Short term stability

DSC: heating from 30 ºC to 300 ºC then cooling down at 5 ºC/min rate for 10 or 20 cycles;

TGA: heating from 30 ºC to 300 ºC at 10 ºC/min rate then cooling down for 10 cycles.

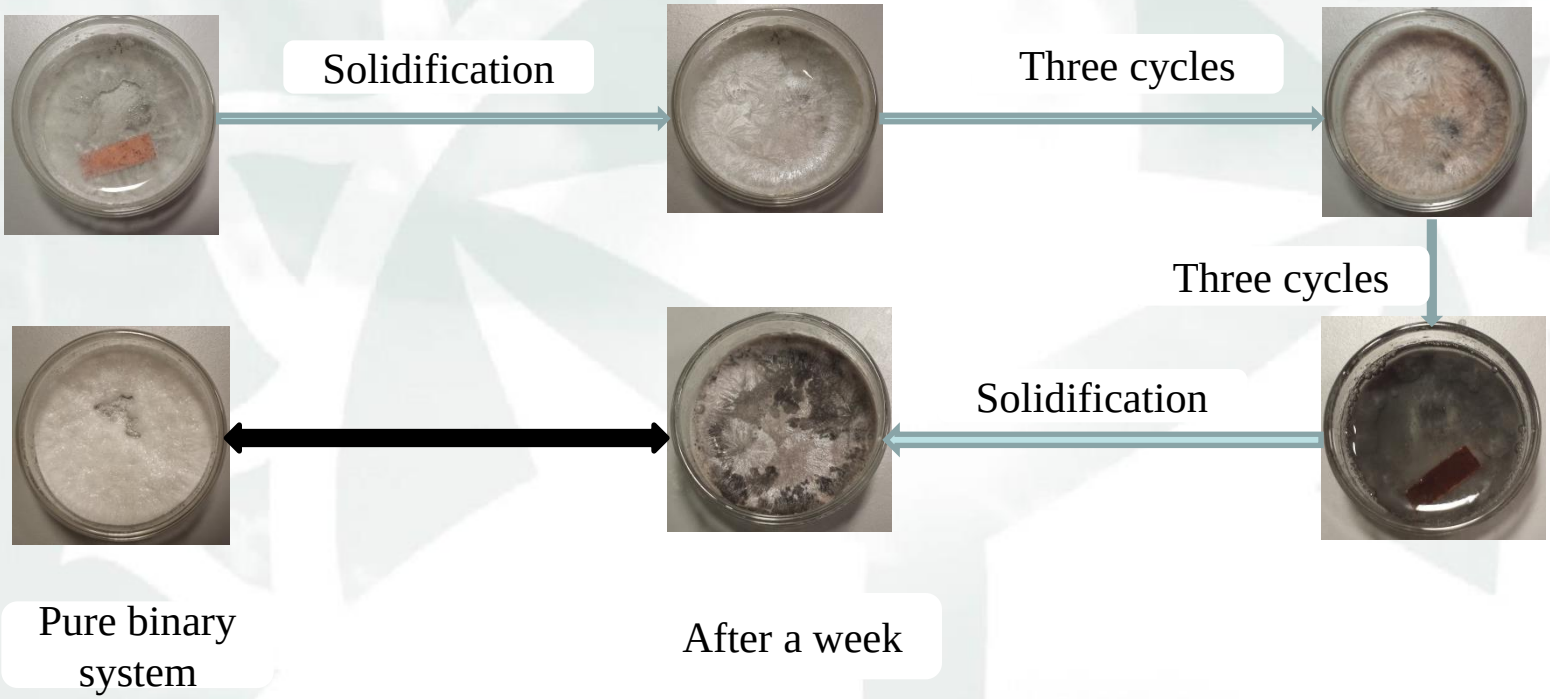
- Long term stability

TGA: (1) heating at a constant temperature for a day. The temperature can be 250 ºC, 300ºC, 400 ºC and 500 ºC; (2)

heating from 30 ºC to 250 ºC, then kept at 250 ºC for a day then cooling down for 10 cycles.

Corrosion

- Copper: oven 250 ºC



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Thank you!

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