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Project ID 33873

Chloride salts are not as corrosive as you think

1. Impact

Chloride salts are candidates for thermal storage but are thought to be too corrosive. This study showed that dried salt, handled properly, is not particularly corrosive at 600°-750°C, ~9 µm/yr corrosion rates

2. Project Goal

Stop relying on electrochemistry and crucible tests and start evaluating salt compatibility in flowing salt with a thermal gradient.

3. Method(s)

#1 Purify or dry the commercial (K,Mg.Na)Cl salt

#2 Build and operate thermal convection loops

#3 Characterize specimens after exposure: mass change, chemical analysis, 25°C tensile tests

4. Outcome(s)

- Demonstrated in 1000 h experiments with peak temperatures of 700° and 750°C that Cl salt compatibility is not as bad as most literature studies and that **salt purification is not necessary** to achieve low reaction rates
- Multiple observations that **iron** (not Cr) was transported, contrary to models and expectations

5. Conclusion/Risks

Initial Cl salt compatibility results are very promising, but we are just scratching the surface on understanding and modeling lifetime

6. Team

- B. Pint/Oak Ridge National Laboratory

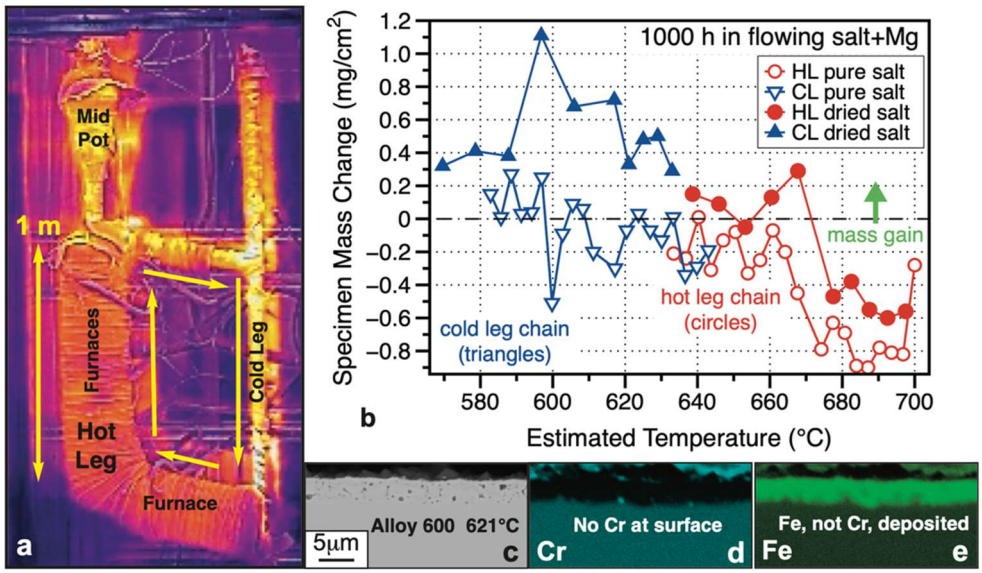

Figure (a) thermal image of operating thermal convection loop, (b) mass change of alloy 600 (NiCrFe) specimen chains in loop hot leg (HL) & cold leg (CL) with purified and dried (K,Mg,Na)Cl salt as a function of estimated specimen temperature, (c) scanning electron cross-section image of alloy 600 after flowing salt CL exposure at 621°C and associated x-ray maps (d) Cr and (e) Fe of the same region showing Fe-rich layer deposited on surface

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