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Recitation 7? – Spectral Emissivity in Molten Salts

MEGN471 – CSM

2022-03-16

Source for numbers: Xie, Ming et. al. Measurement of spectral radiative characteristics of molten salt at high temperature using emission method. Accessed 2022-03-16 at <https://www.sciencedirect.com/science/article/pii/S1359431118351123>

Sometimes people need to move or store lots of heat at very high temperatures, such as with reflective solar energy and metal heat treatment. Since these salts are very hot, the amount of energy they give off from radiation is very large (aka we can't neglect it *sadface*).

Today we'll be exploring the spectral emissivity of solar salt and how its temperature affects its emissivity and emission. The spectral emissivity of solar salt is 0.75 up to 7 $\mu$ m, 0.6 between 7 $\mu$ m and 8 $\mu$ m, and 0.68 above  $\mu$ m. The operating temperature of the salt is between 500K < T < 1400K.

- 1) Draw a spectral emissivity graph.
- 2) What is the emissivity at T=800K?
- 3) What is the emission at T=800K?
- 4) What wavelength has the highest emissivity at this temperature?
- 5) What is the minimum emissivity in the operating temperature range? What is the temperature at that point?
- 6) What is the minimum emission in the operating temperature range? What is the temperature at that range?
- 7) Why are the temperatures at the minimum emissivity and minimum emission different? (Note: this doesn't work with this salt because of its spectral emissivity).