Emissivity of the $Mg_{49}Zn_{51}$ Alloy: a Candidate for Thermal Energy Storage

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Among different kinds of materials, metals and alloys have been proposed as potential candidates as phase change materials (PCM) for thermal energy storage (TES) systems in concentrated solar power (CSP) plants. The eutectic $Mg_{49}Zn_{51}$ alloy seems to be a good PCM candidate since it has an adequate melting point temperature and good specific heat and thermal conductivity values. In order to calculate the thermal heat losses, the radiative properties are studied in this work. Two different emissivity measurement sequences are performed in an inert atmosphere. One of them to observe the phase transitions below the melting point through time dependent measurements at constant temperature. The other is the usual emissivity plot temperature between 200 and 300 ºC. Below the eutectic temperature (341 ºC) a second order phase transition is observed (327 ºC) and its enthalpy must also be taken into account in the thermal energy storage. This phase transition is observed and studied by using spectral emissivity measurements and calculating the total emissivity values. Radiometric measurements are also made in a normal atmosphere in order to observe whether there is any kind of oxidation or not and determine if an inert atmosphere is necessary in a thermal energy storage system.