Analysis Of Continuous Casting System For Casting U-6%wt Zr Slug.

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Abstract

Uranium-rich U–Pu-Zr ternary and U–Pu binary metal alloys are considered to be good alternative fuels for fast reactors. U-6wt.%Zr is one of the candidate blanket materials used in these fuel pins. In this study, U–Zr alloy samples were prepared using continuous casting method. Preparation of U-Zr alloy slugs through continuous casting process needs optimization of processing parameters such as, melt temperature, casting speed, cooling water flow rate in the cooling jacket. To arrive at the possible casting parameters and to reduce the number of experimental runs first computational analysis of the cast slug was carried out using COMSOL Multiphysics. Heat Transfer Module was used to model the phase change from liquid molten state to solid state in continuous casting. The results were validated by simulating the continuous casting process for Copper and Copper-Nickel alloys (Figure 2). Using these simulated results experimental runs was performed and the prepared slugs were further characterized. For casting of 5 mm diameter slug of U-Zr it was established that casting speed of 2mm/s and cooling water flow rate of 0.6 LPM (litre per minute) can be used (Figure 1).

Figures used in the abstract

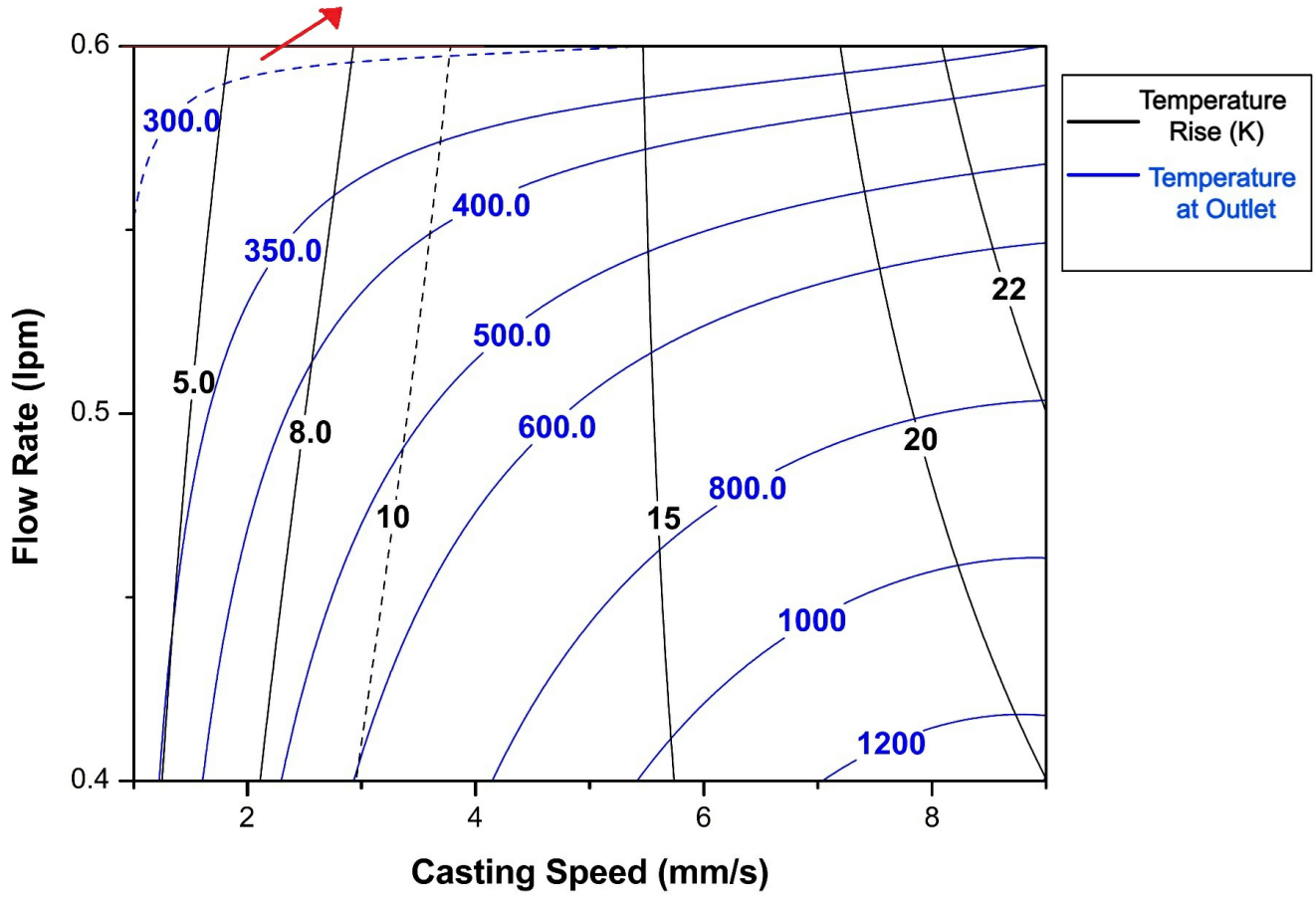

Figure 1 : Variation of the outlet temperature of the U-Zr cast slug and the temperature rise of cooling water at different casting speeds and flow rate.

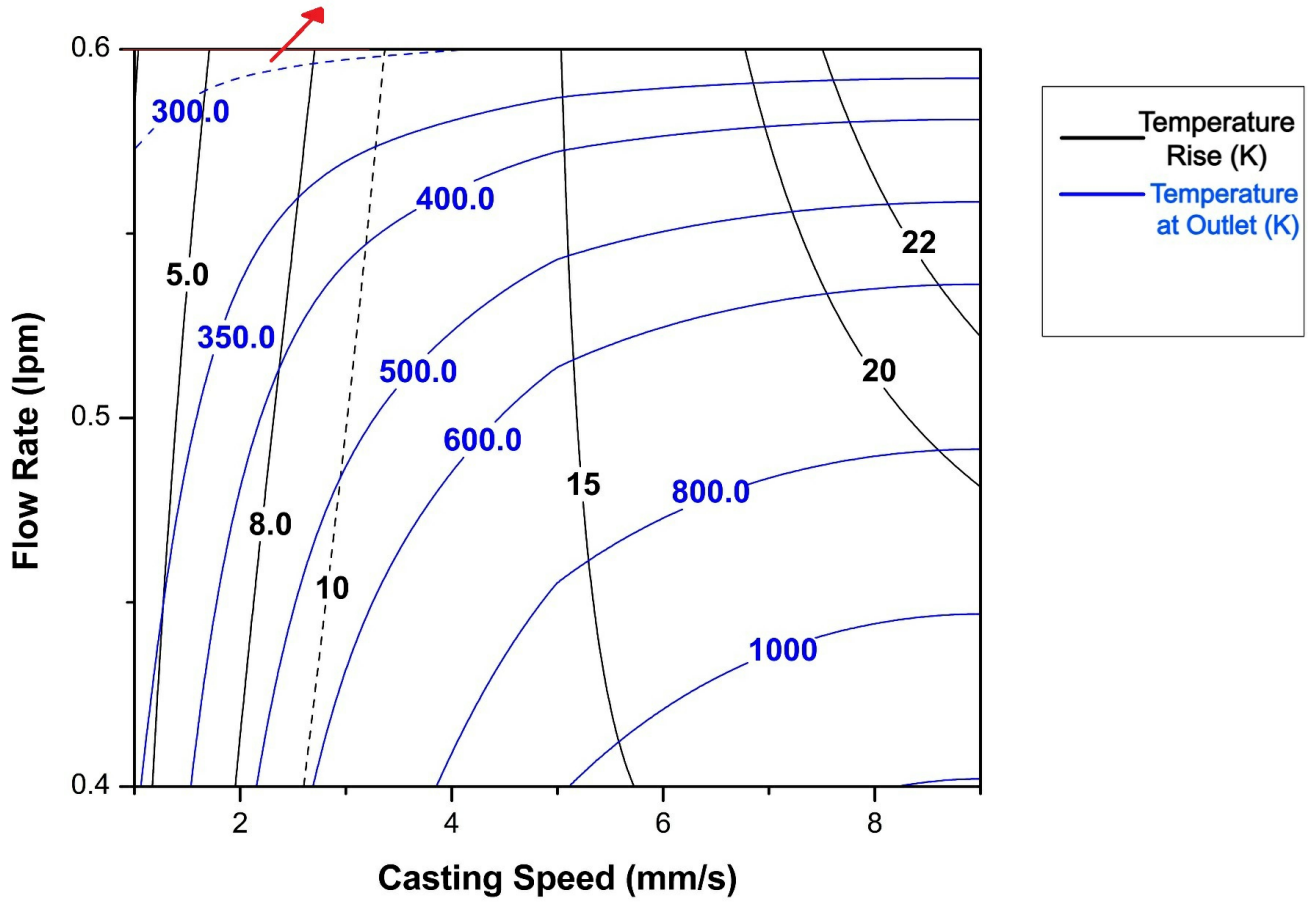

Figure 2 : Variation of the outlet temperature of the Cu-Ni cast slug and the temperature rise of cooling water at different casting speeds and flow rate.