# In-Situ Neutron Diffraction Analysis of Solidification of an Aluminum-17.5%Silicon Alloy at Five Strontium Levels

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In-situ neutron diffraction was used to evaluate the kinetics of the non-equilibrium solidification process of an Al-17.5%Si alloy at five Sr levels from 0% to 0.05%. The purpose of the study was to analyze the effect of Sr on the precipitation of the Si and Al phases and to determine the level of Sr fading that could take place while making long time measurements required for statistical reliability in neutron diffraction studies. Neutron diffraction patterns were collected in a cyclic stepwise mode during solidification between 700°C and 565°C. For three one hour cycles, the variation of intensity of the diffraction peaks for Si and Al were analysed and converted into the rate of phase evolution at various temperatures (Figure 1 and Figure 2). Time sensitive changes in the precipitation of the primary silicon phase were observed.

The data revealed that Sr addition has a pronounced effect on the kinetics of primary Si evolution, as shown in Figure 2, which depicts the suppression of primary Si at the levels of Sr additions exceeding 0.02%. The information obtained on the rate of Sr "fading" and its effect of Si kinetics is crucial for casting technology optimization in manufacturing of hypereutectic Al-Si alloys.

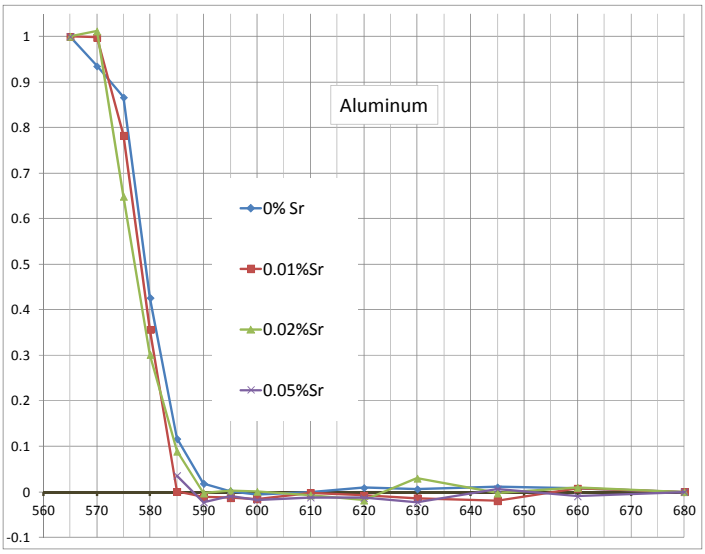


**Fig 1** Evolution of aluminum phases in solidification of Al-17.5%Si alloy for five levels of Sr addition.

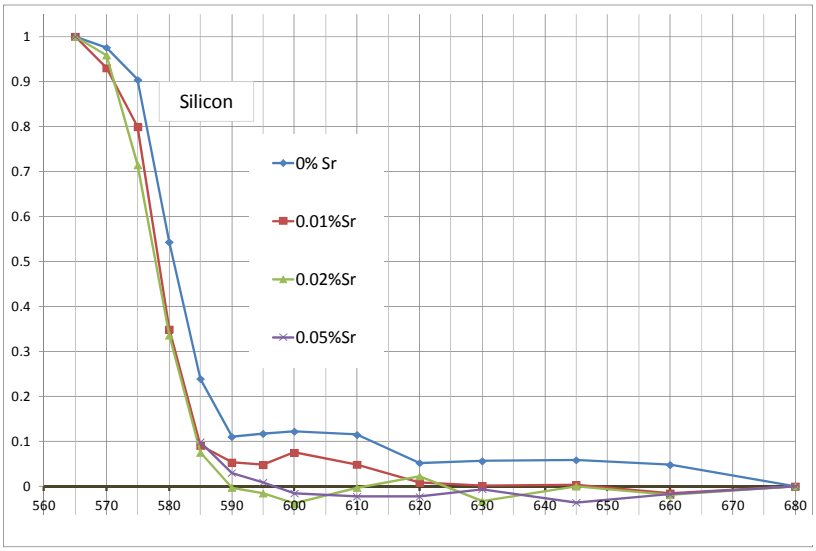


**Fig 2** Evolution of silicon phases in solidification of Al-17.5%Si alloy for five levels of Sr addition.