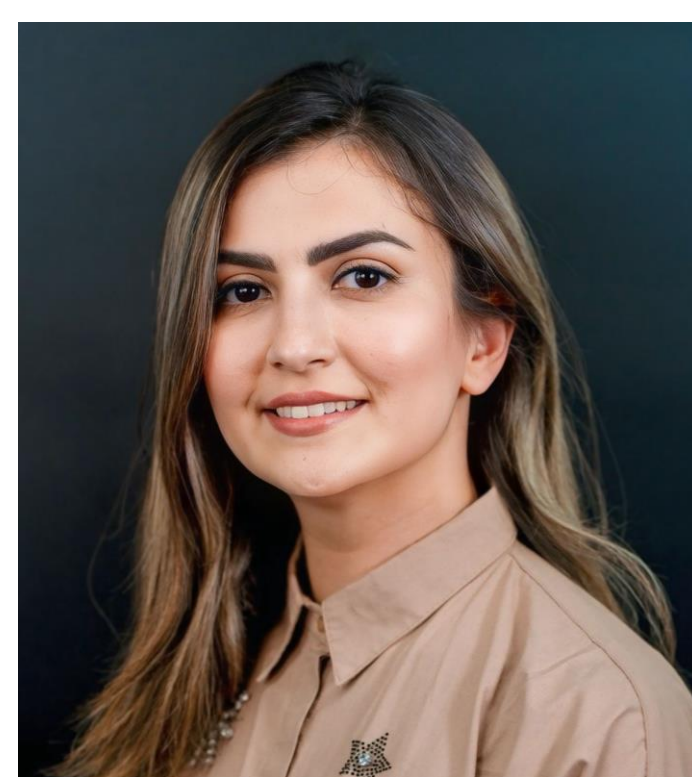




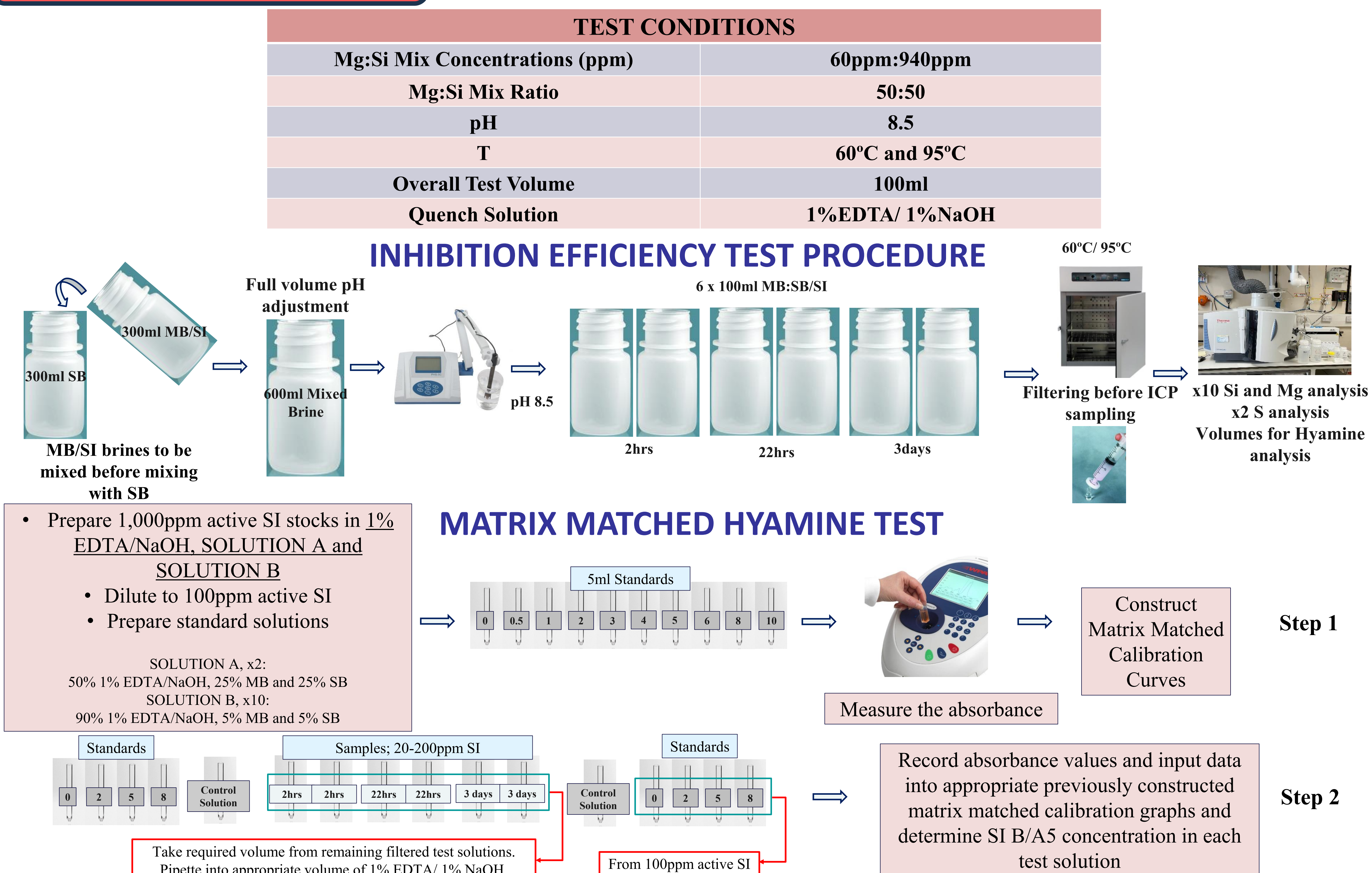
Silicate Scale Prevention in Geothermal Brine Systems: Comparing the Mechanism and Performance of Two Polymer-Based Inhibitors

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BACKGROUND

- Geothermal power plants - energy extraction operational problem - **silica scaling**
- This research - established static bottle test methodology, to identify efficient scale inhibitors /dispersants with high inhibition performance of 80-90% for low ($\leq 95^\circ\text{C}$) enthalpy geothermal heat recovery systems.
- Investigated two sulphonated polymer products to control amorphous silicate and magnesium silicate scales - denoted SI B and A5.
- Studied inhibition efficiency (IE) and inhibition mechanism.

METHODOLOGY

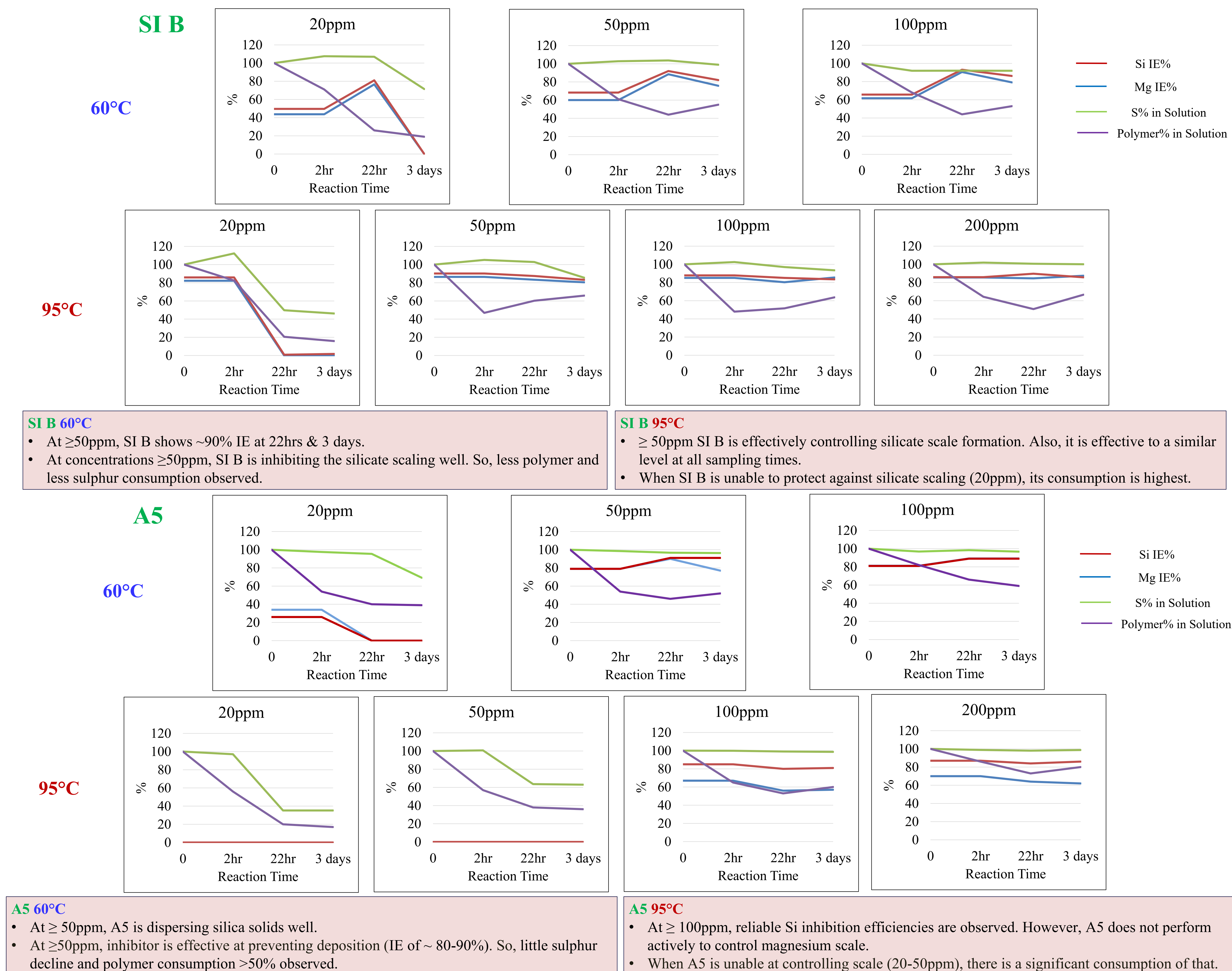


RESULTS

OBJECTIVE

- Scale inhibitor concentrations of 20-200ppm, A5 and SI B were examined for IE performance.
- Inhibition mechanism evaluation by two methods:
 - Determining the sulphur (S) concentration contained within the A5 and SI B structure by Inductively Coupled Plasma - Optical Emission Spectrometer (ICP-OES).
 - Detecting the functional groups of the polymer by the matrix - matched Hyamine method.
- The novelty of this research:
 - Reporting silica inhibition data relating to polymeric SI B.
 - Monitoring the specific A5 and SI B scale inhibitors, by ICP-OES and Hyamine techniques to give insights on the inhibition - performance and mechanisms.

IE, Sulphur and Polymer in Solution (%)



Conclusions

- The Hyamine technique was selected as the more robust method for determining the SI consumption, as it monitors higher proportion of polymer as functional groups.
- At 60°C and 95°C, an MIC of ~ 50 ppm SI B was identified to control amorphous silicate scale and magnesium silicate scale with 60-90% IE & 40-60% polymer consumption over 3 days.
- For A5 at 60°C, ≥ 50 ppm records 80-90% IE with 40-50% polymer consumption. However, at 95°C, ≥ 100 ppm A5 gives 80% IE and $\sim 40\%$ consumption over 3 days.
- SI B is the more effective SI under the tested conditions.