Si Precipitation Experimental Procedure

1. Simulated brine formulas were prepared based on review of existing literature. 2 brine strengths were utilized (high and low).

2. Si precipitation was attempted through pH adjustment only and pH adjustment + metal addition. Metals ($FeCl_3$ and CaO) were added in metal-to-Si atomic ratios of approximately 2:1, 5.65:1, and 10:1.

3. Brine pH was adjusted to 9.0 and 10.5 and maintained at a constant value.

4. Temperature was varied for 50 ^{o}C and 80 ^{o}C.

5. Solutions gently mixed for a 30 minute reaction duration.

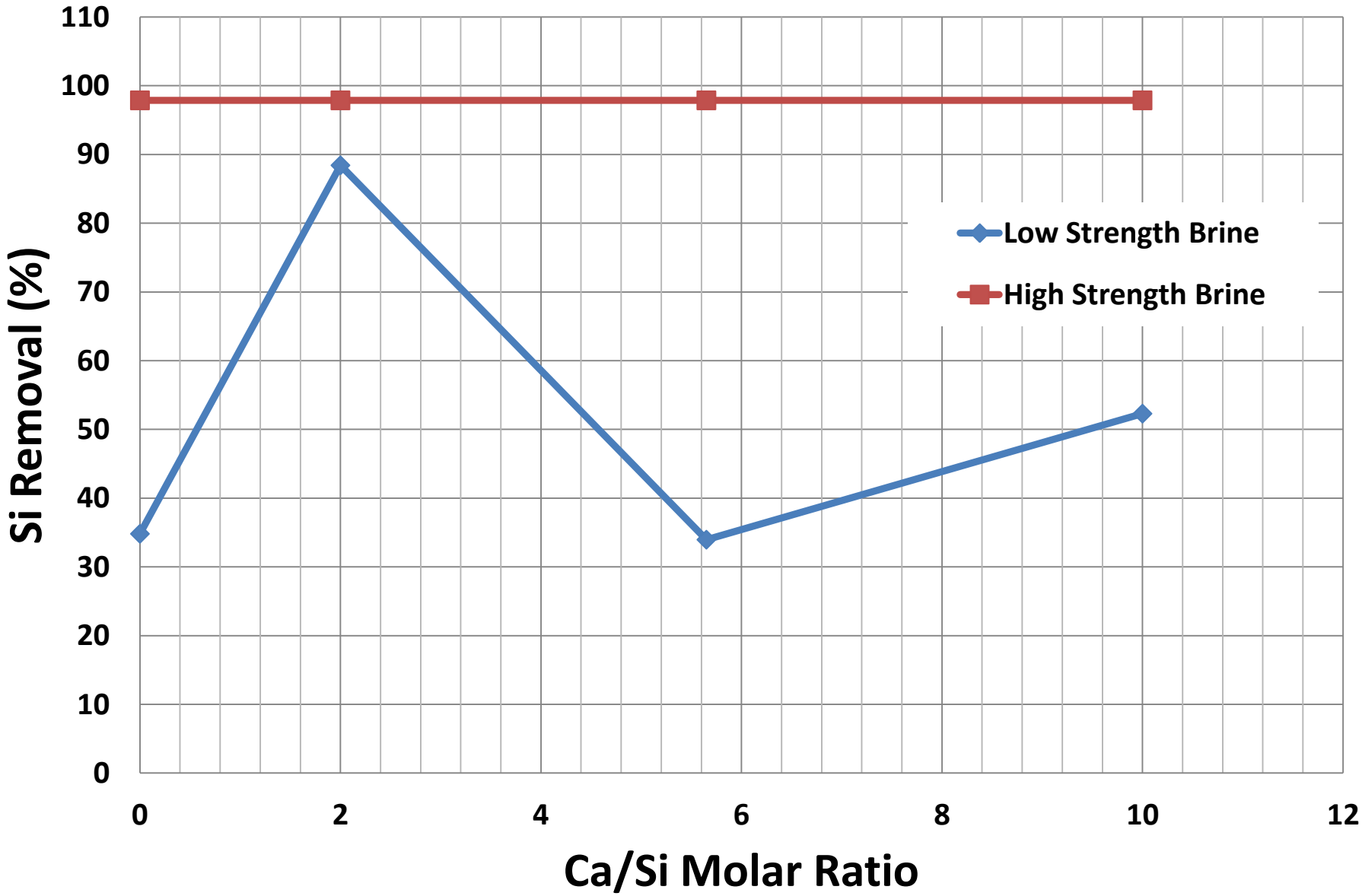
6. Immediately after 30 minutes, solutions were filtered and the filtrate was sent for analysis, Inductively Coupled Plasma – Mass Spectrometry (ICP-MS).

7. If the Si concentration was less than detection limit, the concentration was assumed to be half the detection limit.

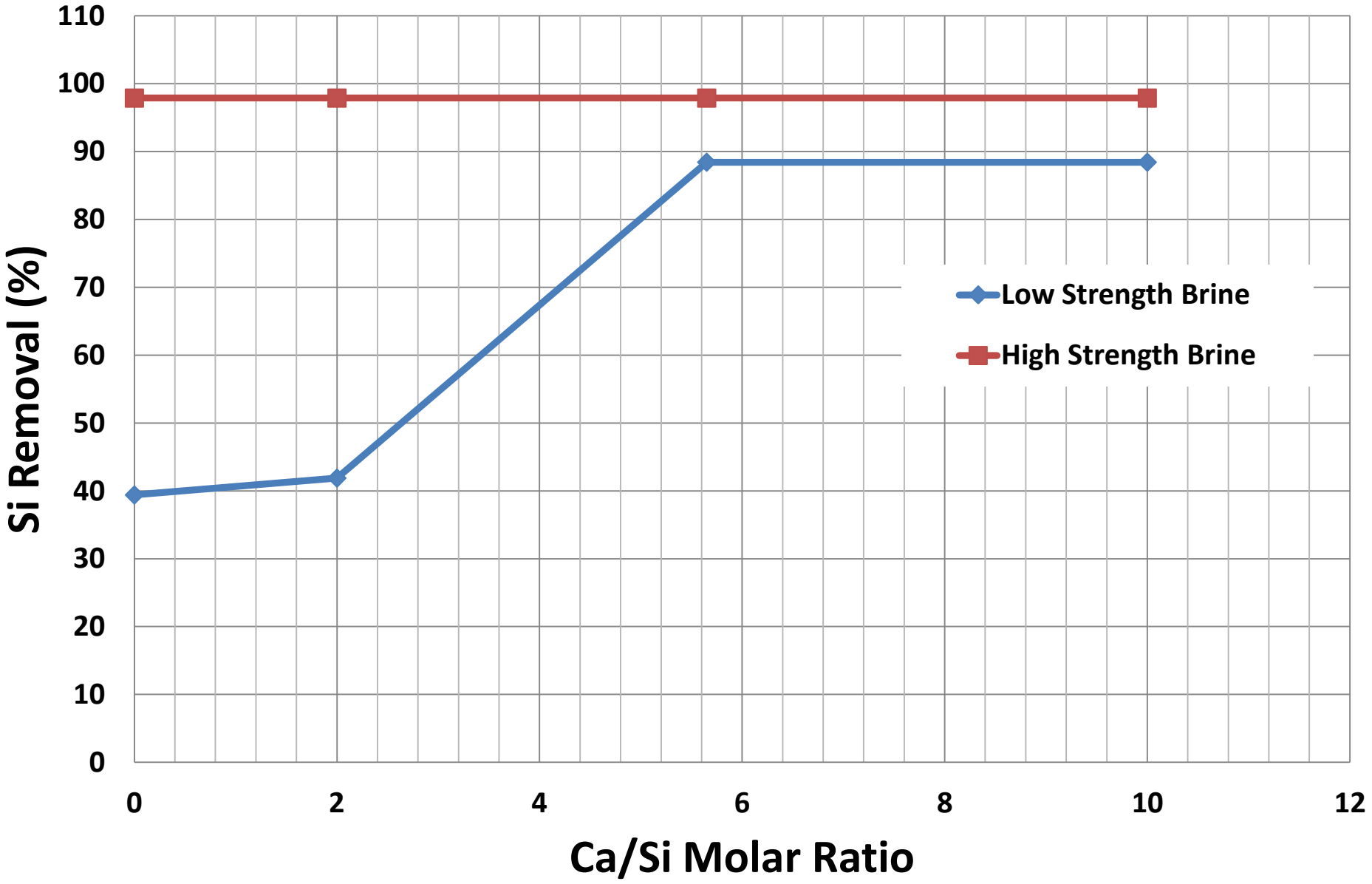
Simulated Brines for Si Precipitation Experiments

Component	Low Strength Brine Concentration (mg/L)	High Strength Brine Concentration (mg/L)
Si	10	114
Li	2	29
Na	1,700	7,466
K	232	632
Mg	20	245
Ca	20	425
SO_4	75	448
Cl	2,856	13,141

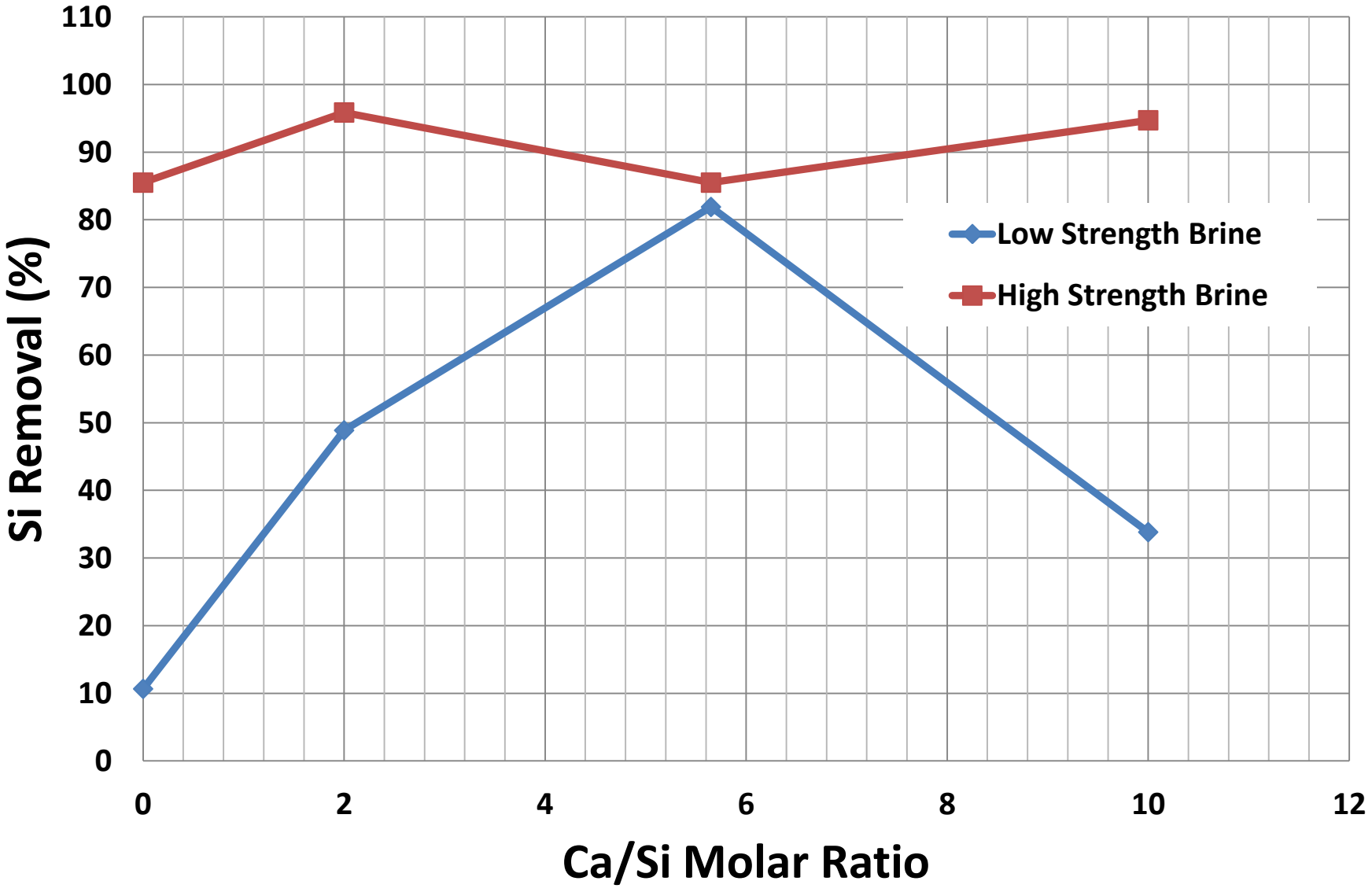
pH Adjusted to 9.0 and CaO Addition – Temp. = 80 °C



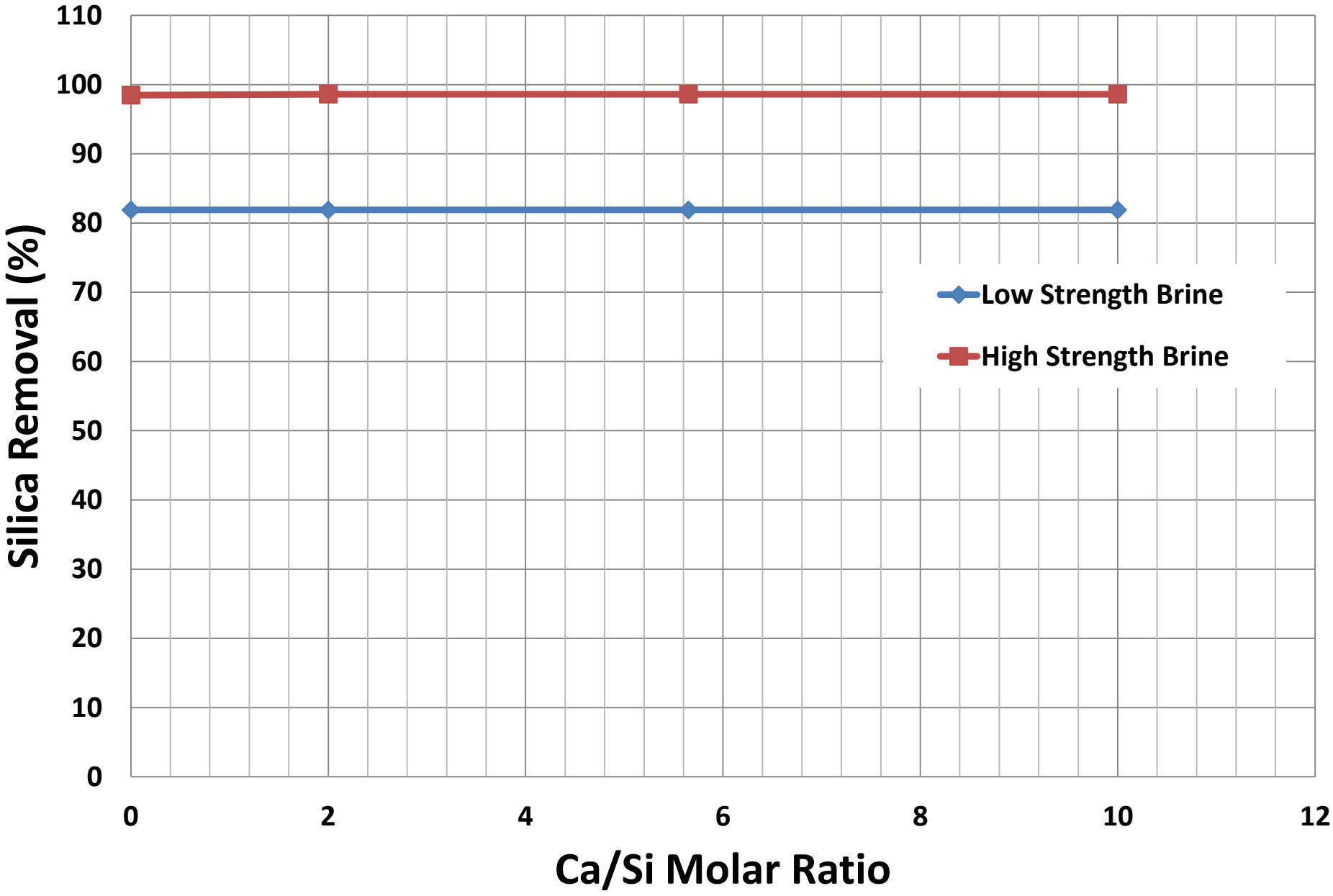
pH Adjusted to 10.5 and CaO Addition – Temp. = 80 °C



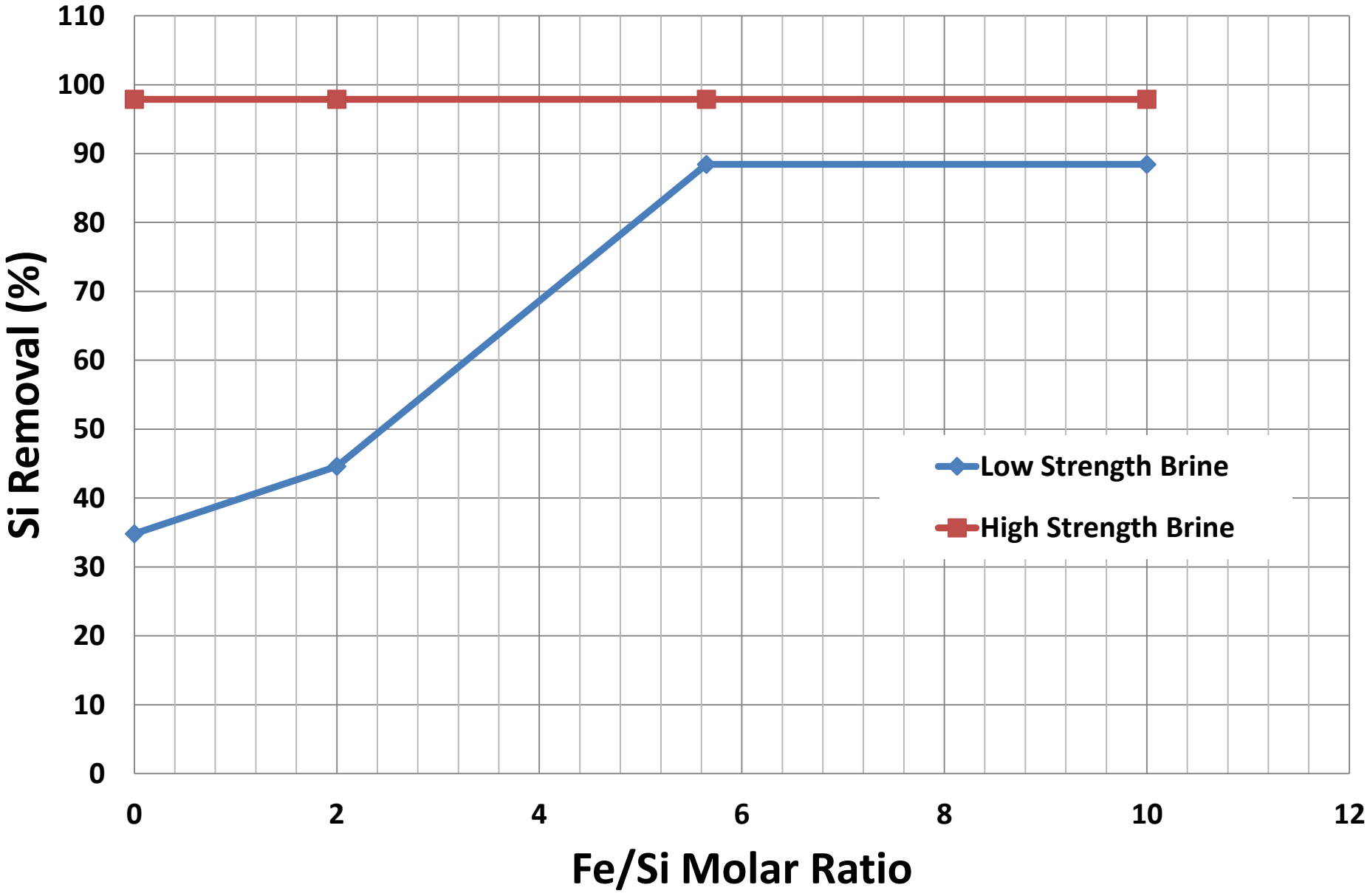
pH Adjusted to 9.0 and CaO Addition – Temp. = 50 °C



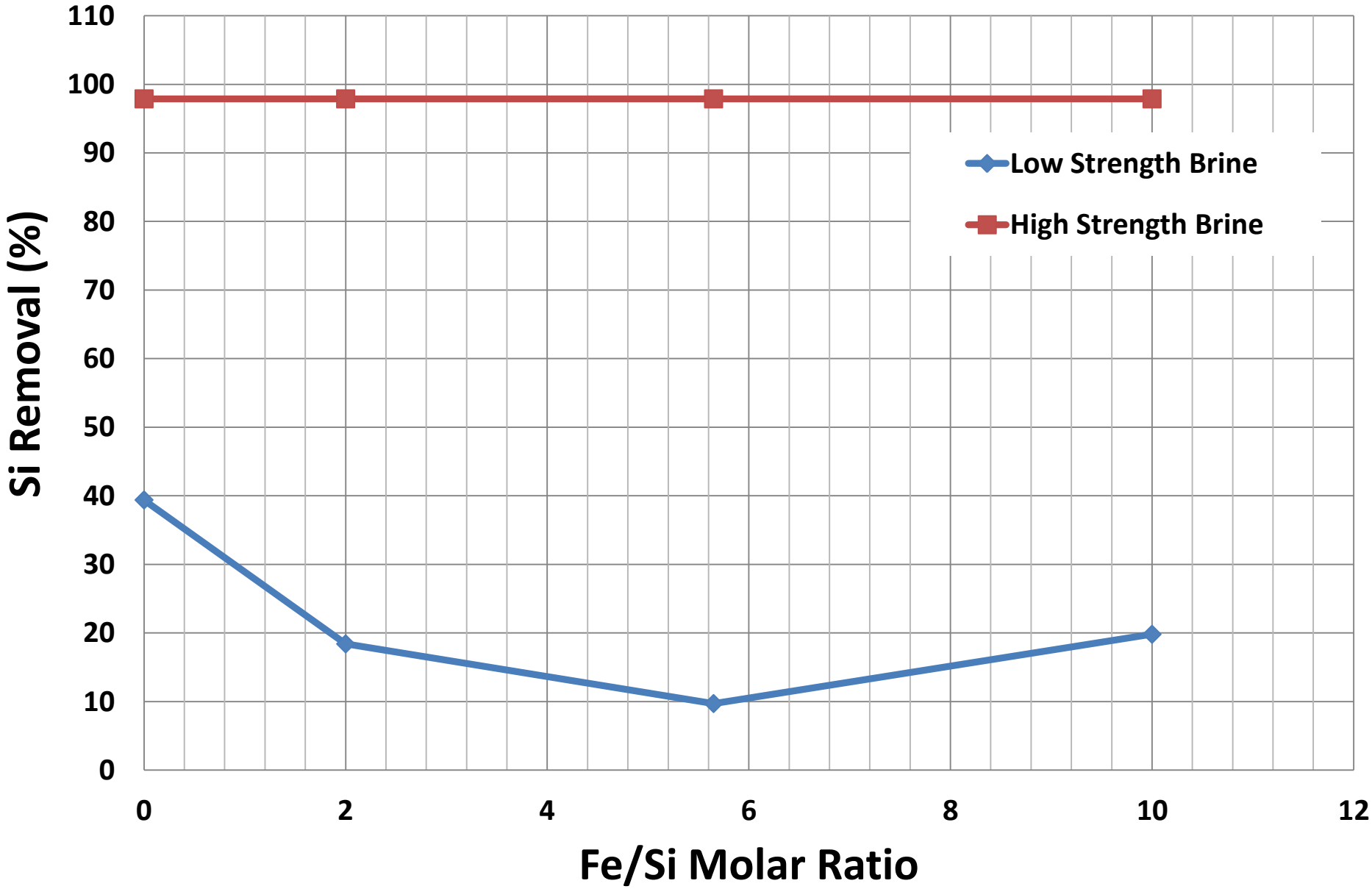
pH Adjusted to 10.5 and CaO Addition – Temp. = 50 °C



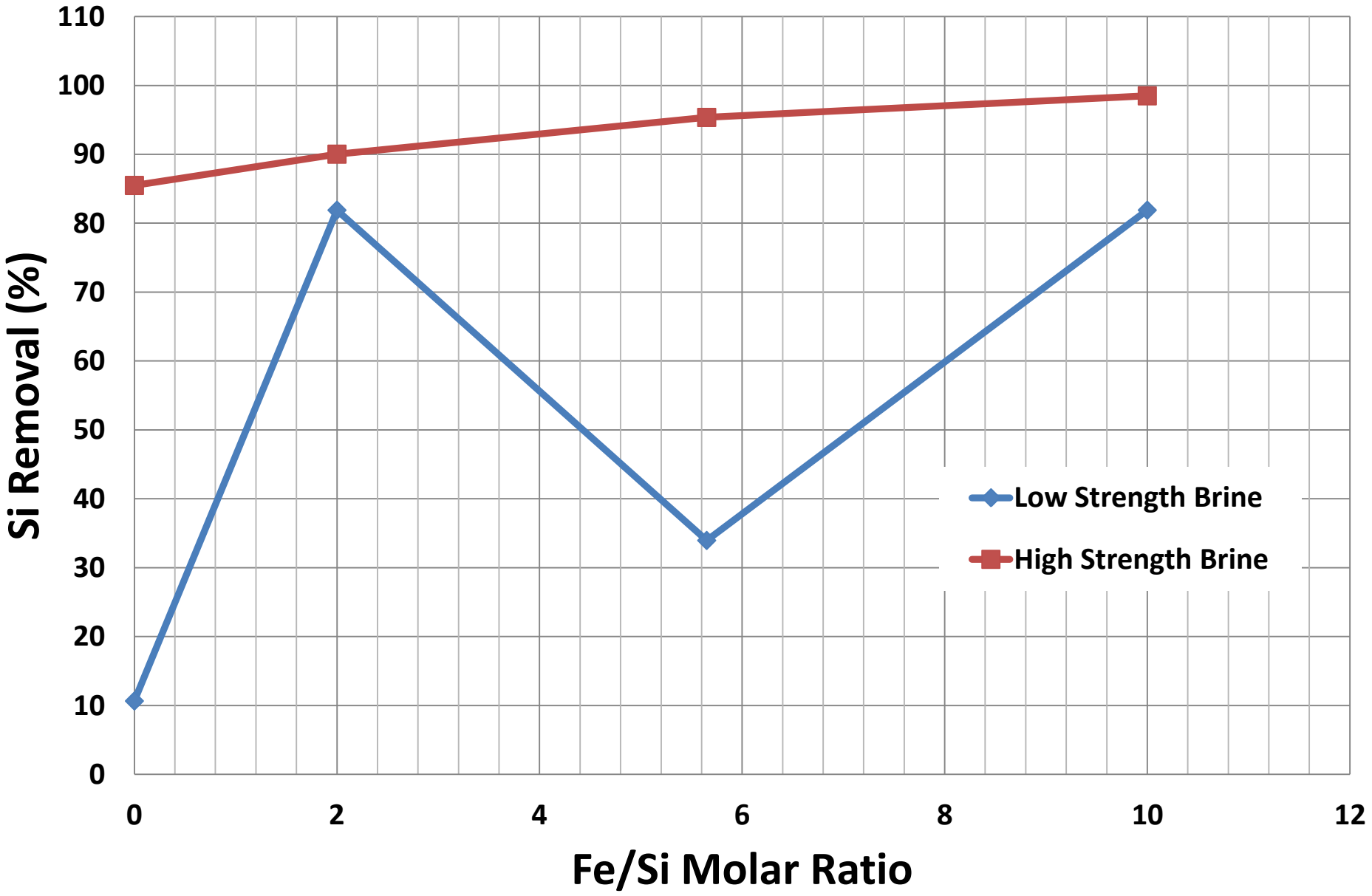
pH Adjusted to 9.0 and $FeCl_3$ Addition – Temp. = 80 °C



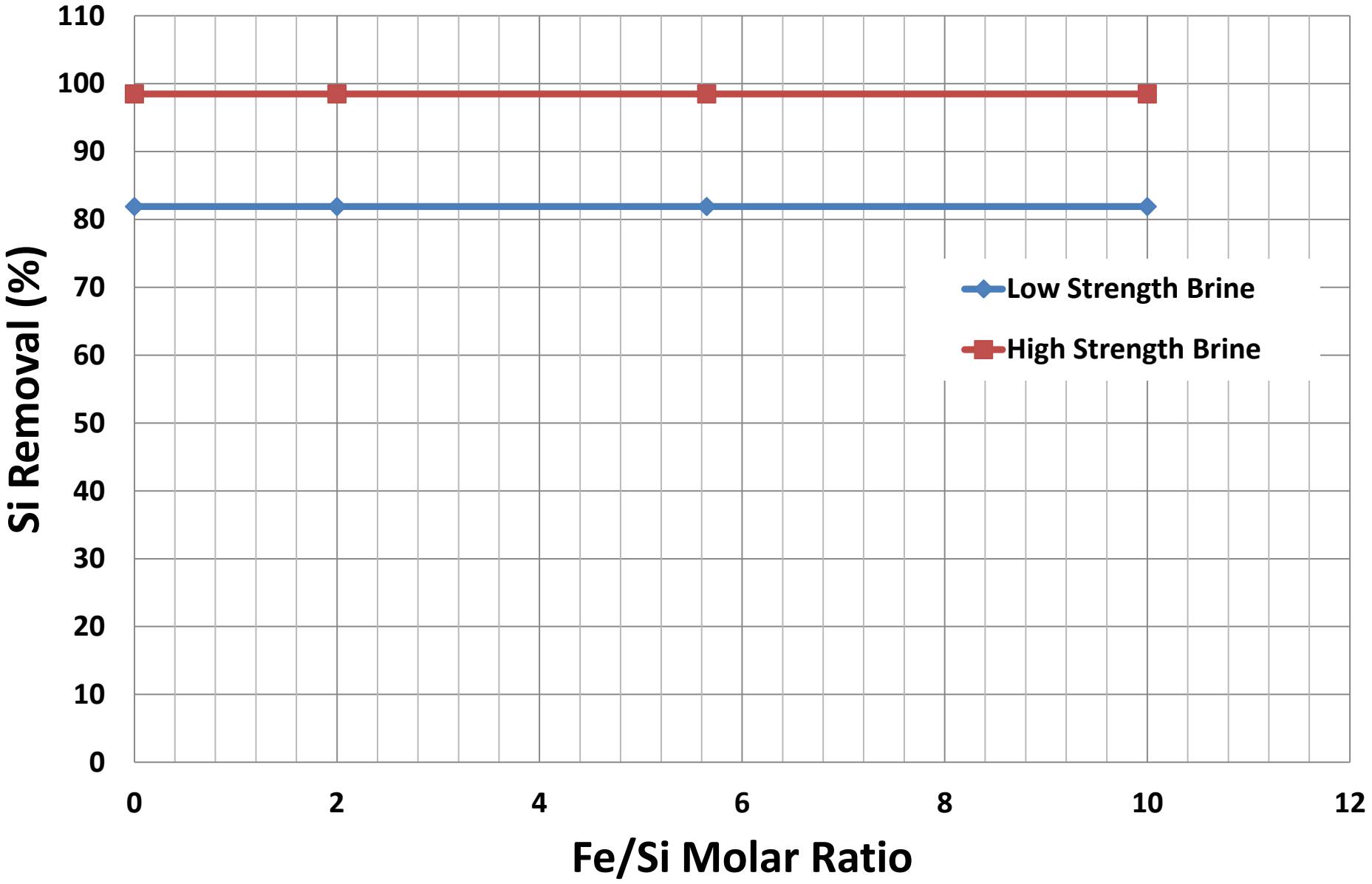
pH Adjusted to 10.5 and $FeCl_3$ Addition – Temp. = 80 °C



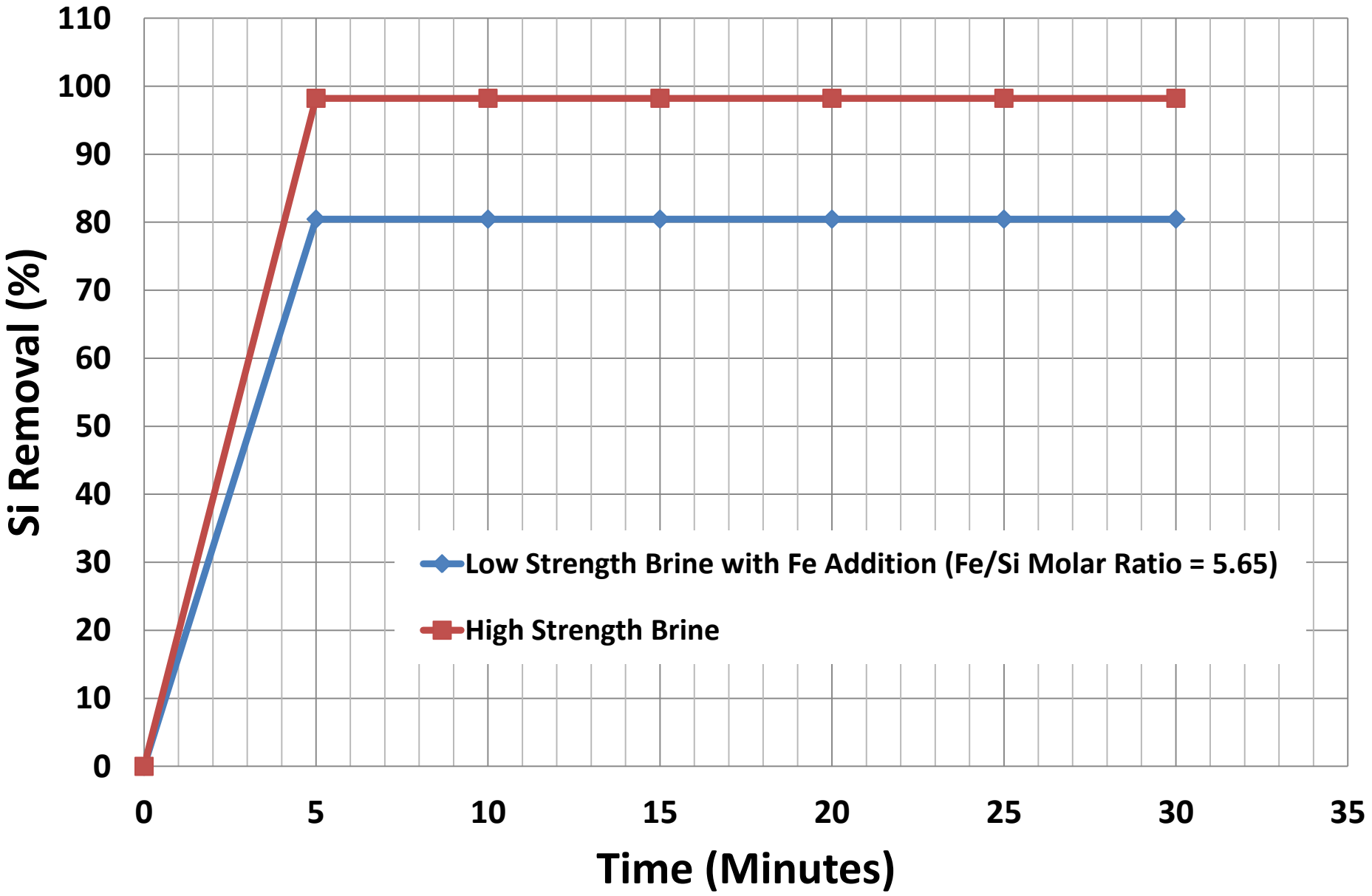
pH Adjusted to 9.0 and $FeCl_3$ Addition – Temp. = 50 °C



pH Adjusted to 10.5 and $FeCl_3$ Addition – Temp. = 50 °C



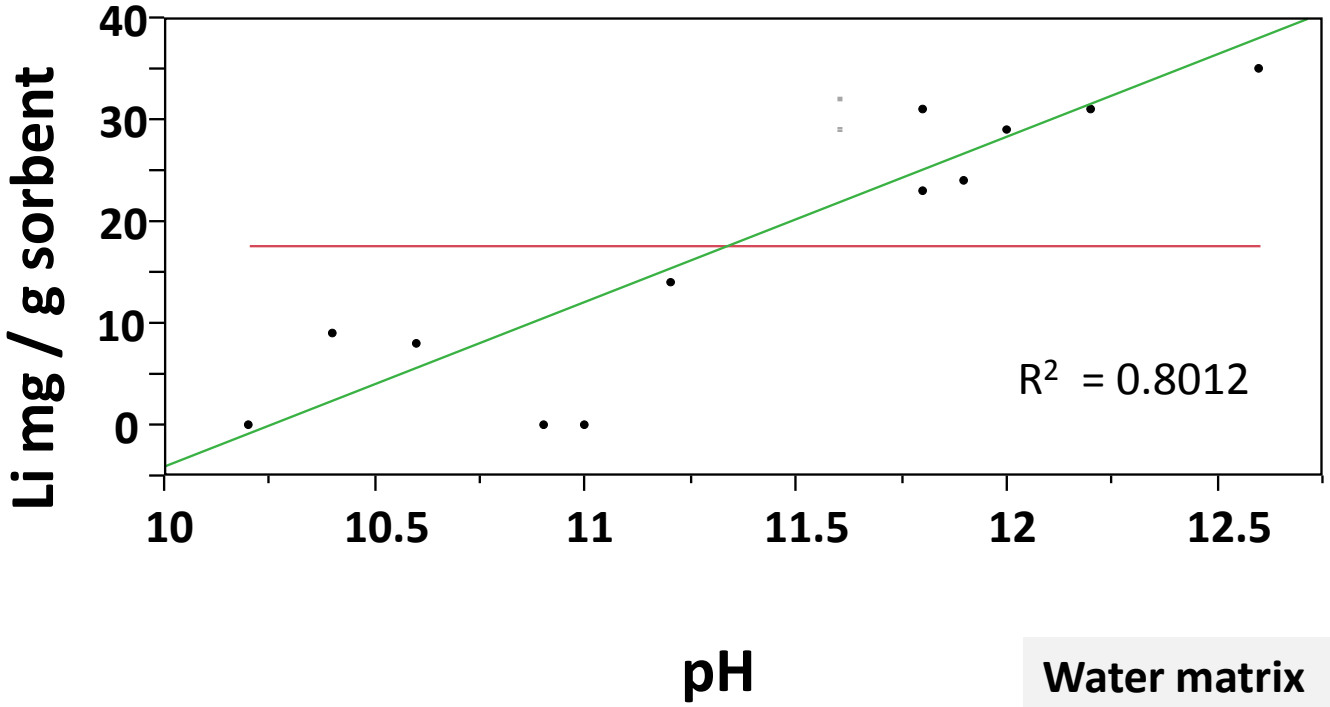
Kinetics for Best Conditions – Temp. = 80 °C - pH = 9.0



Li Sorption Experiments – Simulated Concentrated Brines

Component	Brine A (mg/L)	Brine B (mg/L)
Ca	60	866
Li	20	284
Mg	60	735
Si	10	89
Na	11,392	51,740
Cl	19,094	90,465
SO_4	750	4,463

Li Sorption Experiments – Impact of pH

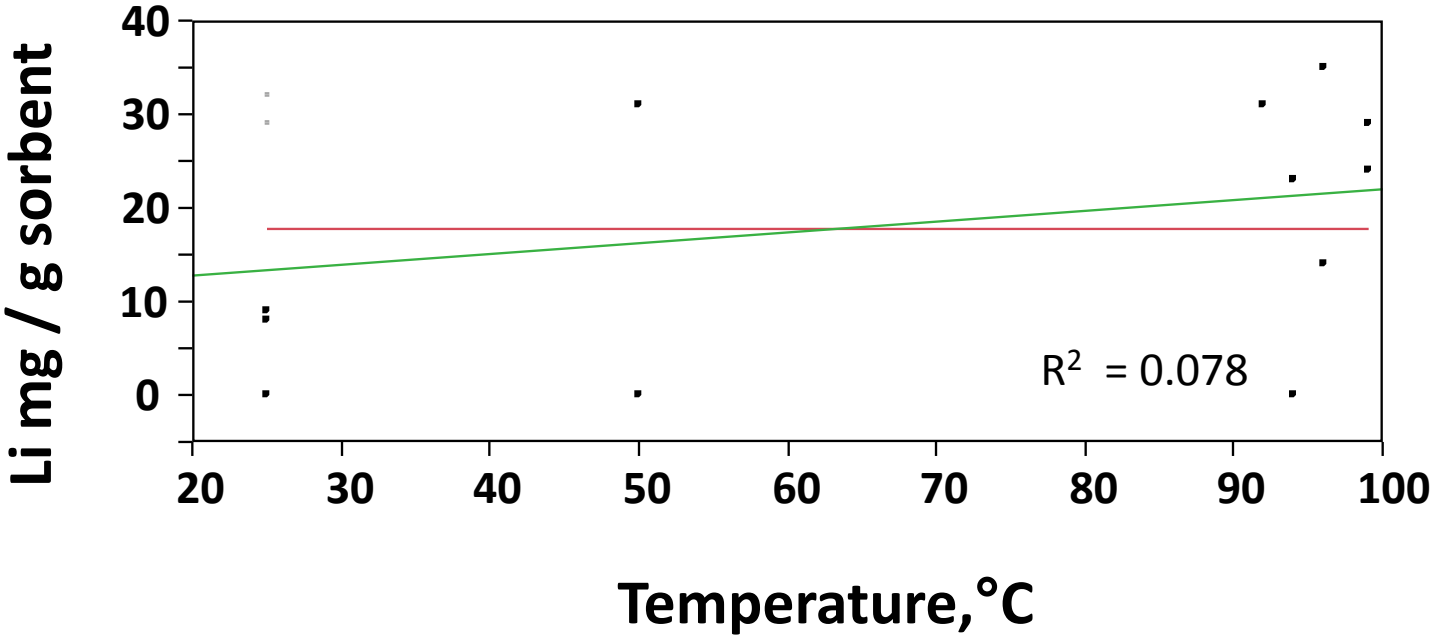


Water matrix
70 mg/L Li
1 hr. contact time

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2096.9497	2096.95	52.3851
Error	13	520.3837	40.03	**Prob > F**
C. Total	14	2617.3333		<.0001*

Li Sorption Experiments – Impact of Temperature



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	205.3014	205.301	1.1065
Error	13	2412.0319	185.541	**Prob > F**
C. Total	14	2617.3333		-0.3120

Water matrix
70 ppm Li
1 hr. contact time

Li Sorption Experiments – Impact of Brine Chemistry