

# Water Quality and Reuse in the Southwest US

## Hard Water Effects in the Home



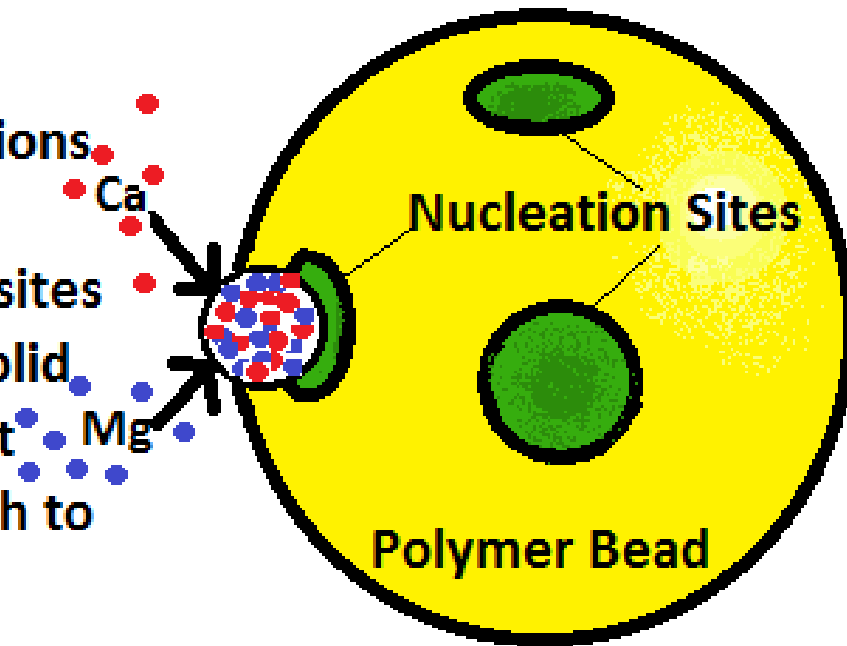
- Spotted dishes from the dishwasher
- An inability for soap to lather and soap scum deposits
- Scale formation on faucets and showerheads
- Scale accumulation in pipes
- Scale fouling in water heaters increasing energy usage by up to 24%
- Scale formation on appliances

Calcium carbonate becomes less soluble at higher temperatures.

# No-Salt Alternatives to Ion Exchange

## Template Assisted Crystallization






Mg and Ca ions collect on nucleation sites and form solid crystals that won't attach to surfaces






# Experimental Procedure



# Results

Water Type	Treatment device used	Scale scraped off of heating element (g)	% Ca in scale formed	Ca formed in solid scale precipitate (g Ca)	Scale from bath and heating element dissolved with HCl (g Ca as CaCO <sub>3</sub> )	Total calcium formed during test (g Ca as CaCO <sub>3</sub> )	Photo of heating element with scale
Tempe tap water	No Treatment	-	NA	0.00	8.36	8.36	
	TAC	0.00	NA	0.00	0.12	0.12	
	EIP	0.68	34.88	0.24	3.60	3.84	
	MAG	1.44	34.88	0.50	3.47	3.97	
	CDI	0.00	NA	0.00	1.41	1.41	

# Results

Water Type	Treatment device used	Solid calcium collected from element (g Ca)	Scale from bath and heating element dissolved with 0.18N HCl (g Ca as CaCO <sub>3</sub> )	Scale from bath dissolved with 1N HCl (g Ca as CaCO <sub>3</sub> )	Total calcium formed during test (g Ca as CaCO <sub>3</sub> )	Photo of heating element after 21 days of testing
Tempe tap water 60°C	No Treatment		5.92	19.00	24.92	
	TAC		0.83		0.83	
	EIP	0.33	5.88	7.19	13.40	
	MAG		6.20	7.00	13.20	