

## Carbonate Hardness:

associated w/  $\text{HCO}_3^-$  &  $\text{H}_2\text{CO}_3$

e.g.,  $\text{CaCO}_3$ ,  $\text{MgCO}_3$

NCH: associated w/  $\text{Cl}^-$  &  $\text{SO}_4^{2-}$

e.g.,  $\text{CaSO}_4$ ,  $\text{CaCl}_2$

$\text{MgSO}_4$ ,  $\text{MgCl}_2$

Minor  $^{2+}$   
w/  $\text{Mn}^{2+}$   
 $\text{Fe}$

		MW, g/mol	mg/meq Eq. wt	meq/L
ex: $\text{H}_2\text{CO}_3$	= 72 mg/L	62	31 $\frac{72}{31}$	= 2.32
$\text{Ca}^{2+}$	= 75 mg/L	40	20	3.75
$\text{SO}_4^{2-}$	= 60 mg/L	96	48	1.25
$\text{Cl}^-$	= 25 mg/L	35.5	35.5	0.70
(alkalinity) $\text{HCO}_3^-$ (alk)	= 195 mg/L	100	50	3.9
$\text{Mg}^{2+}$	= 6.1 mg/L	24.4	12.2	0.50
<u>Total Hardness</u>	= $\text{Mg}^{2+} + \text{Ca}^{2+}$			

$$= 0.5 + 3.75 = 4.25 \text{ meq}$$

$$= 4.25 \frac{\text{meq}}{\text{L}} \times \frac{50 \text{ mg CaCO}_3}{\text{meq}}$$

$$= 212.5 \frac{\text{mg}}{\text{L}} \text{ as CaCO}_3 \blacktriangleleft$$

$$\text{Non Carb. Hardness} = 4.25 - 3.9 = 0.35 \frac{\text{meq}}{\text{L}} = 175 \frac{\text{mg}}{\text{L}} \text{ as CaCO}_3 \blacktriangledown$$

$$\text{Carb Hardness} = 3.9 \frac{\text{meq}}{\text{L}} \times 50 = 195 \frac{\text{mg}}{\text{L}} \text{ as CaCO}_3 \blacktriangledown$$

⚡ Not all  $\text{SO}_4^{2-}$  &  $\text{Cl}^-$  = NCH; only that amt that complexes w/  $\text{Ca}^{2+}$  &  $\text{Mg}^{2+}$ ;  $\therefore$  NCH also a f( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ )

Target  $\text{Mg}^{2+}$  &  $\text{Ca}^{2+}$  based hardness - will more than soften adequately.