

## Carbonates

hardness of water

↳ temporary

caused because of  $\text{Ca}^{2+}$ ,  $\text{HCO}_3^-$ ,  $\text{Mg}$

↳ Permanent

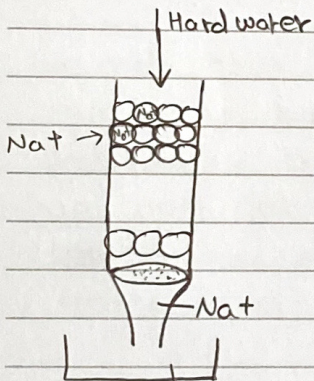
caused because of  $\text{Ca}^{2+}$   $\text{CO}_3^{2-}$   
 $\text{Mg}^{2+}$   $\text{CO}_3^{2-}$

If there is water containing  $\text{Ca}(\text{HCO}_3)_2 \xrightarrow{\Delta} \text{CaCO}_3(\text{s}) + \text{H}_2\text{O} + \text{CO}_2$

↓  
insoluble  
thus is filtered off

because  $\text{HCO}_3$  is soluble,  $\text{CO}_3$  is insoluble so will see precipitate so neither  $\text{Ca}^{2+}$  ion nor  $\text{Mg}^{2+}$  will be mixed so safe for consumption.

To remove permanent hardness use ion exchange columns.



First add conc. NaCl to column then when the hard water is added to this column, ~~and~~ the  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions replace the  $\text{Na}^{+}$  ions. The  $\text{Na}^{+}$  ions get displaced and come to the bottom of the column.

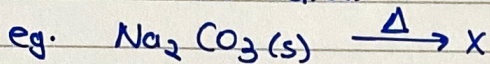
water without  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions is called soft water



## Effect of heat:

on group 1

↳ No reaction



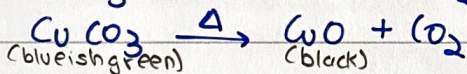
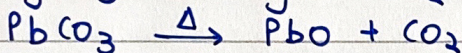
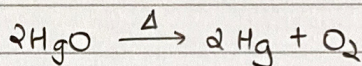
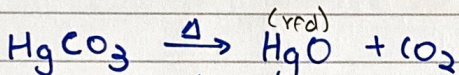
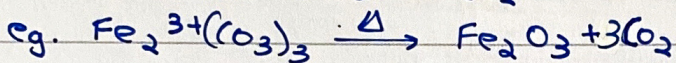
in group 2

↳ decomposes



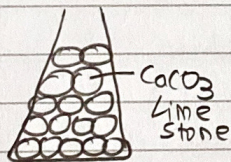
in Transition metals.

↳ forms oxide +  $\text{CO}_2$

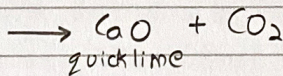


## Use in Lime kiln

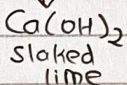
thermal decomposition + addition of water } turns limestone to lime water



$\text{CaCO}_3$   
Lime Stone



↓  $\text{H}_2\text{O}$ , slaking lime

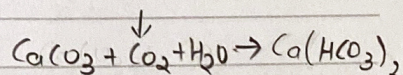
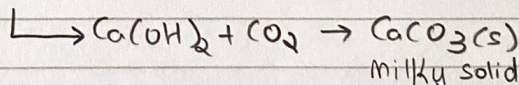


Filter

Residue  
 $\text{Ca(OH)}_2$

filtrate  
 $\text{Ca(OH)}_2$

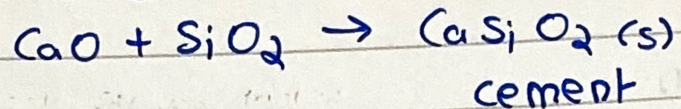
Lime water





Making cement

↳ in a blast furnace



CaO → basic

→ used to remove acidic impurities in ores.