

Limescale is primarily calcium carbonate,  $\text{CaCO}_3$  which is the precipitate formed when using hard water. All acids react with carbonate compounds to liberate  $\text{CO}_2$  gas.

Citric and sulfamic acids are all weak acids, but are capable of supplying  $\text{H}^+$  ions in solution. The  $\text{H}^+$  ions react with  $\text{CaCO}_3$  like this:



The limescale is dissolved. The anion of the acid is also in solution with the calcium ions. This solution can be easily washed away, and the limescale is gone. Weak acids like the acetic acid found in vinegar are used because they do less damage to surrounding metals.