Lithium Hydroxide Synthesis through use of Hydrogen Peroxide

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Synthetic Route

$$Brine + HCl \rightarrow LiCl + H^+$$ **(1) Priming**

(Note $[Cl^-] > [H^+]$)

$$2\,Cl^-_{(aq)} + H_2O_{2(aq)} + 2\,H^+_{(aq)} \rightarrow 2\,H_2O_{(L)} + Cl_{2\,(g)}$$ **(2) Chlorine Removal**

(Note pH > 7)

$$LiOH_{(aq)} + H_2O_{2(aq)} \rightarrow LiO_2H_{(aq)} + H_2O_{(L)}$$ **(3.1) Competing Reaction**

$$2\,LiO_2H_{(aq)} \rightarrow Li_2O_{2(aq)} + H_2O_{2(aq)} + 2\,H_2O_{(L)}$$ **(3.2) Decomposition**

$$2\,Li_2O_{2(aq)} + H_2O_{(L,\ hot)} \rightarrow 4\,LiOH_{(aq)} + O_{2(g)}$$ **(3.3) Equilibrium**

$$H_2O_{2(aq)} + Light \rightarrow H_2O_{(L)} + \tfrac{1}{2}\,O_2 + Heat$$ **(4) Equilibrium Break***

*This decomposition causes the equilibrium to favor **3.3** thereby giving the desired product

Engineering Perspective