

APPENDIX C
EXAMPLE FOR CALCULATION

C.1 Power Supply for Electrolysis Process

From the experimental results on the direct current 30 A power supply to electrolyzer and the temperature controlled at 343 K.

Current = 30 A, Potential = 5.68 V

Power input is equal to $30 \times 5.68 = 170.4$ W.

C.2 Calculation of Hydrogen Production Rate

Volume of hydrogen = 106.67 mL

Time interval of reaction = 22.07 s

Rate of hydrogen production is equal to

$$\begin{aligned} \dot{m} &= \frac{V \times 60}{\text{time}} & (C.1) \\ &= \frac{106.07 \text{ mL} \times 60 \frac{\text{s}}{\text{min}}}{22.07 \text{ s}} \\ &= 290.02 \text{ mLmin}^{-1} \end{aligned}$$

C.3 Calculation of Energy Efficiency

Volume of hydrogen = 106.67 mL

Time interval of reaction = 22.07 s

HHV of hydrogen = 142.18×10^6 Jkg⁻¹

Density of hydrogen at 343 K = 0.070856 kgm⁻³

Current = 30 A, Potential = 5.68 V

Energy efficiency is equal to

$$\begin{aligned} \eta &= \left(\frac{v \cdot \text{HHV} \cdot \rho}{I \cdot V \cdot t} \right) \times 100 & (C.2) \\ &= \frac{(0.10667 \times 10^{-3} \text{ m}^3) \times (142.18 \times 10^6 \frac{\text{J}}{\text{kg}}) \times (0.070856 \frac{\text{kg}}{\text{m}^3})}{30 \text{ A} \times 5.68 \text{ V} \times 22.067 \text{ s}} \times 100 \\ &= 28.57 \% \end{aligned}$$