Specific heat of hydrogen gas at constant pressure

The specific heat capacity measures the amount of heat required to change the temperature of a substance by one degree Celsius. For hydrogen gas at constant pressure, the specific heat capacity is defined as the heat required to increase the temperature of a given mass of hydrogen gas by one degree Celsius at constant pressure.

The specific heat capacity of hydrogen gas at constant pressure can be calculated using the formula:

$$ c_p = \frac{Q}{m \Delta T} $$

where $c_p$ is the specific heat capacity of hydrogen gas at constant pressure, $Q$ is the amount of heat required, $m$ is the mass of the hydrogen gas, and $\Delta T$ is the change in temperature.

Under standard conditions (0°C and 1 atm), the specific heat capacity of hydrogen gas is 3.8 J/g°C. However, this value can change depending on the pressure and temperature conditions.

For example, at high pressures and temperatures, the specific heat capacity of hydrogen gas can be calculated using the equation:

$$ c_p = \frac{R}{\gamma - 1} $$

where $R$ is the gas constant, and $\gamma$ is the ratio of specific heats.$22.0^\circ C$ (right)

Solving this:

$$ c_{metal} = \frac{- \left( 4.184 \times 10^3 \text{J/g} \cdot \text{°C} \right)}{4.184 \times 10^3 \text{J/mol} \cdot \text{°C}} = 0.38 \text{J/g} \cdot \text{°C} $$

Our experimental specific expanded form, this is:

$$ c_{metal} \times m_{metal} \times \left( T_{f,water} - T_{i,water} \right) $$

Noting that since the metal was submerged in boiling water, the temperature difference is $100^\circ C$.

The experiment can be carried out by placing the sample in a bomb, two chemicals are combined to produce heat. This means that the amount of heat produced or consumed in the reaction equals the amount of heat transferred to or from the surroundings. The work done is negligible. As a result, the final state of the system is at the temperature of the surroundings. The heat capacity is determined by the change in temperature of the surroundings.

The change in temperature of the surroundings is given by:

$$ \Delta T = \frac{Q}{cm} $$

where $Q$ is the amount of heat transferred, $c$ is the specific heat capacity of the surroundings, and $m$ is the mass of the surroundings.

Therefore, the specific heat capacity of hydrogen gas at constant pressure can be determined experimentally by measuring the amount of heat required to increase the temperature of a given mass of hydrogen gas by one degree Celsius at constant pressure.