Investigation of Platinum Substitutes as an Effective Catalyst for Hydrogen Fuel Cells

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One significant problem with fuel cells is that they are costly to construct because of the expensive platinum catalyst. Palladium has similar chemical properties to platinum and is approximately 65% of its price. This project compared copper and palladium, against platinum as catalysts in a hydrogen fuel cell. The primary hypothesis was that palladium would work as effectively as platinum as a catalyst in a hydrogen fuel cell. Experiments were conducted by constructing 5 simple hydrogen fuel cells with different anode and cathode combinations. Voltage produced was measured at 15 temperature levels from 10 °C to 80 °C and the efficiency of fuel usage was measured and compared by measuring the changes of voltage over time duration. The results showed that the platinum fuel cell had the highest average voltage produced at all temperatures levels and consumed fuel the most efficiently. However when palladium was used as an anode and platinum as a cathode, the results did not differ significantly from the purely platinum-based catalyst fuel cell and the fuel consumption efficiency difference was negligible. In conclusion the anode reactions were non-sensitive to the type of metal whereas the cathode reactions were. The platinum anode in fuel cells can be replaced by cheaper palladium because the cell will still produce a similar output voltage and it presents a more cost effective alternative to using only platinum in a hydrogen fuel cell.

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