Gas Producing Reactions

Many types of chemical reactions produce gaseous substances. These types of reactions may be classified as: single displacement or double displacement. In this experiment, you will investigate these types of reactions.

Materials
- 3 M HCl
- Na₂CO₃
- Small pieces of zinc
- CaCO₃
- Small pieces of magnesium
- Spot plate
- Dropper

Procedure
1. Place a piece of each solid (Zn or Mg) or a small amount of granular solid (using the tip of a spatula) in the wells of a spot plate—as indicated on the diagram.

2. Add 10 drops of 3 M HCl to each of the four wells.

3. Note any bubbling or fizzing indicating the production of a gas in the Data section.

4. Write a balanced equation for the reactions that occur. Include physical state symbols for the reactants and products.

5. There are two different gases produced in this set of reactions. What are the gases? What tests could you perform to verify your hypotheses?

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Data and Observations

I. __________________________________________________________
   Identity of gas produced:____________________________________

II. __________________________________________________________
   Identity of gas produced:____________________________________

III. __________________________________________________________
   Identity of gas produced:____________________________________

IV. __________________________________________________________
   Identity of gas produced:____________________________________

What are the tests that will verify the identity of these gases?
Teacher’s Notes

I. \( \text{Zn (s)} + 2\text{HCl (aq)} \rightarrow \text{ZnCl}_2 (aq) + \text{H}_2 (g) \)

II. \( \text{Mg (s)} + 2\text{HCl (aq)} \rightarrow \text{MgCl}_2 (aq) + \text{H}_2 (g) \)

III. \( \text{Na}_2\text{CO}_3 (s) + 2\text{HCl (aq)} \rightarrow 2\text{NaCl (aq)} + \text{H}_2\text{O (l)} + \text{CO}_2 (g) \)

IV. \( \text{CaCO}_3 (s) + 2\text{HCl (aq)} \rightarrow \text{CaCl}_2 (aq) + \text{H}_2\text{O (l)} + \text{CO}_2 (g) \)

Test for:

\( \text{H}_2(g) \): A burning splint will pop in the presence of hydrogen. Hydrogen is explosive. Remember the Hindenburg? See Experiment 8.

\( \text{CO}_2(g) \): A burning splint will be extinguished in the presence of carbon dioxide. See Experiment 9.

Disposal:
Solids should be placed in solid waste containers. Aqueous solutions can be poured down the drain with added water.