Empirical Formula Of Magnesium Oxide Report Solution

Empirical Formula Of Magnesium Oxide Report Solution Empirical Formula of Magnesium Oxide A Laboratory Report Solution This report details the experimental determination of the empirical formula for magnesium oxide MgO a simple ionic compound The experiment involves reacting magnesium metal with excess oxygen to produce magnesium oxide By carefully measuring the masses of the reactants and product we can calculate the mole ratio of magnesium to oxygen in the compound leading to the empirical formula Magnesium oxide empirical formula combustion stoichiometry mole ratio limiting reactant experimental error The experiment aims to verify the empirical formula of magnesium oxide through a simple reaction involving the combustion of magnesium metal in air The steps involved in the experiment include 1 Weighing Accurately measuring the mass of a clean magnesium ribbon 2 Combustion Burning the magnesium ribbon in a crucible to form magnesium oxide 3 Cooling Allowing the crucible and its contents to cool to room temperature 4 Weighing Determining the mass of the magnesium oxide produced 5 Calculations Utilizing the masses of magnesium and magnesium oxide the mole ratio of magnesium to oxygen is calculated 6 Empirical formula determination The calculated mole ratio is used to determine the simplest wholenumber ratio of magnesium and oxygen atoms in the compound representing the empirical formula Experimental Procedure 1 Materials Magnesium ribbon approximately 02 g Crucible and lid Bunsen burner Tongs 2 Electronic balance Beaker Distilled water 2 Procedure Preparation Clean the crucible and lid thoroughly Weigh the empty crucible and lid using an electronic balance recording the mass Magnesium Weighing Cut a piece of magnesium ribbon approximately 02 g in mass Weigh the magnesium ribbon using the electronic balance and record the mass Combustion Place the magnesium ribbon inside the crucible and cover it with the lid Heat the crucible gently with a Bunsen burner until the magnesium ignites and burns brightly Be careful not to touch the crucible directly while it is hot Cooling After the magnesium has completely reacted allow the crucible to cool to room temperature Weighing Weigh the crucible lid and magnesium oxide using the electronic balance Record the mass Cleaning Dispose of the magnesium oxide according to proper laboratory waste disposal procedures Clean the crucible and lid thoroughly Results and Calculations 1 Mass of magnesium Record the initial mass of the magnesium ribbon 2 Mass of magnesium oxide Subtract the mass of the empty crucible and lid from the total mass after the reaction 3 Mass of oxygen Subtract the mass of magnesium from the mass of magnesium oxide to find the mass of oxygen that reacted 4 Moles of magnesium Divide the mass of magnesium by its molar mass 2431 gmol 5 Moles of oxygen Divide the mass of oxygen by its molar mass 1600 gmol 6 Mole ratio Divide the number of moles of magnesium by the number of moles of oxygen The result should be close to 11 indicating the empirical formula of magnesium oxide is MgO Discussion The experimental results will likely show a slight deviation from the expected 11 mole ratio This deviation can be attributed to various sources of error Incomplete combustion If the magnesium does not burn

completely the mass of magnesium oxide will be lower leading to an incorrect mole ratio Reaction with air The reaction with oxygen is not the only reaction occurring Magnesium can 3 also react with nitrogen in the air to form magnesium nitride Mg3N2 This will affect the mass of the product and the calculated mole ratio Impurities The magnesium ribbon might contain impurities which will affect the mass of the product and the calculated mole ratio Handling errors Errors in weighing the reactants and products can also contribute to inaccuracies The presence of these errors will affect the calculated empirical formula However by carefully performing the experiment and understanding the potential sources of error we can obtain a relatively accurate result Conclusion This experiment demonstrates the determination of the empirical formula of magnesium oxide through a simple combustion reaction By measuring the masses of the reactants and products we can calculate the mole ratio of magnesium to oxygen in the compound While experimental errors can lead to slight deviations from the theoretical value the experiment provides valuable insights into the concept of stoichiometry and the importance of careful measurements in chemistry The results obtained from this experiment can be further enhanced by incorporating techniques such as Improving combustion Utilizing a controlled atmosphere with pure oxygen or an inert gas to minimize the impact of air contamination Analyzing impurities Performing additional analysis to identify and quantify any impurities present in the magnesium ribbon Replicating the experiment Repeating the experiment multiple times and averaging the results to minimize the impact of random errors ThoughtProvoking Conclusion This experiment not only demonstrates the empirical formula determination but also emphasizes the importance of recognizing limitations and potential sources of error in experimental science It encourages further exploration and refinement of experimental techniques to achieve greater accuracy and better understand the complexities of chemical reactions FAQs 1 Why is the empirical formula not always the same as the molecular formula 4 The empirical formula represents the simplest wholenumber ratio of atoms in a compound The molecular formula represents the actual number of atoms of each element in a molecule For example the empirical formula of glucose is CH2O while its molecular formula is C6H12O6 2 How does the presence of impurities affect the empirical formula calculation Impurities can lead to an inaccurate measurement of the mass of magnesium and magnesium oxide thus affecting the calculated mole ratio and empirical formula 3 Why is it important to cool the crucible to room temperature before weighing Hot crucible and lid will radiate heat and cause the balance to read an inaccurate mass 4 What are some other methods for determining the empirical formula of a compound Other methods include elemental analysis which involves determining the percentage composition of each element in the compound and Xray diffraction which provides information about the arrangement of atoms in a crystal 5 How can we improve the accuracy of the empirical formula calculation Employing more precise measurement tools minimizing handling errors and using controlled conditions like pure oxygen for the reaction can improve the accuracy of the calculation

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a study was made of solid solutions of mgo with mn fe and co oxides to determine the effect of extended heat treatment and of controlled furnace atmospheres on the formation of superlattices heat treatments involving temperatures up to 1350 c and times up to 600 hours were used furnace atmospheres were controlled so as to be either neutral slightly oxidizing or slightly reducing with respect to the divalent metallic ions indications of ordering were found in those compositions that were heated in reducing atmospheres a broad diffraction peak was found at 6 4 angstroms which is three times the 002 spacing of the unordered lattices

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