Developing an activity series for metal copper

Technology, Development

In a single displacement reaction for metals, if no reaction happens when two reactants are added together, then the single metal element being added to the impound must be less reactive than the metal element in the compound. Thus, if reaction happens when two reactants are added together, the single metal element is more reactive than the metal element in the compound. Conclusion: In this investigation, an activity series of metal Copper (II), Magnesium and Nickel was developed by carrying out nine reactions of these three types of metals with three types of aqueous solutions.

Each type of metal was submerged in each type of solution for two minutes to check if a chemical reaction would happen and thus develop an activity series by analyzing the data collected. The purpose of this investigation was to develop an activity series for the metal copper (II), magnesium and nickel, and an activity series was developed by conducting this experiment; that is: among the three metals used for this lab, magnesium has the highest metal reactivity, copper is the second reactive metal and nickel has the relatively lowest reactivity.

By looking at Table 1, the times of a chemical reaction occurs of each metal with a solution could be easily told: three times for magnesium, one time for copper (II) and none for nickel. Recall that these three types metals were carried out reactions tit the same three solutions: lead (II) nitrate, zinc nitrate and iron (Ill) nitrate. This means, the metal which reacts the most times with the solutions will be the most reactive one among the three metals because it is proved to be more reactive than all three metal elements in the solutions, as shown in Table 2.

On the other hand, the other two less reactive metals have carried out only one or even none reactions, meaning that one of them is more reactive than one metal element in a solution and another one is less reactive than all metal elements in all solutions. Table 3 shows a summary of the process of developing the activity series for the three metals. By comparing reactivates of the metals (strips) and the metals in solutions, an activity series can be drawn.

For example, if copper (II) is less reactive than zinc, as shown in table 3, and magnesium is more reactive than zinc, then as a result magnesium has to be more reactive than copper (II). And if nickel is less reactive than iron (lll) and copper (II) is more reactive than iron (lll), then copper (II) is more reactive than nickel. Thus, magnesium is the most reactive metal among the here metals used in this investigation, copper (II) is the second reactive metal and nickel is the least reactive metal. Three reactions were carried out between magnesium and three solutions, indicating that magnesium is relatively the most reactive metal.

If there was no reaction between it and a solution, then the chemical equations in the prediction part must be wrong because products would not have been produced at all. Evaluation: There were two sources of errors in the design of this investigation. One was the equipment selected for submerging the metal strip into the solution and taking it UT of the solution was bare hand instead of tweezers, which could lead to inaccurate results and cause irritation. This may have occurred because of the general

knowledge of the metals and solutions used in this investigation are harmless and/ the lack of equipment (tweezers and/ disposable gloves).

Another shortcoming in the design of this investigation was the use of only one emery board for scrubbing all three metal strips. They both could have had effects on the results. And this may have occurred because of the lack of equipment (emery boards) or the amount of teal atoms being transferred is not going to change the reaction. However, they could both effect the data in an unwanted way. For the first one, by submerging different metal strips into different solutions and taking out them out of the solutions using bare hands, solution and/ metal atoms could be transferred from one beaker to another with the unclean hands.

Thus the reaction could be affected because the solution is not pure anymore, another metal(s) are added to the solution so the chance of having a chemical reaction is increased since the amount of an element that could cause a chemical reaction to append was not clarified; however, there could be no reaction if the solution was pure. As a result, the activity series would have been different at the end if the reactions were affected. Not only that, since some people may have sensitive skin or are allergic to some metals that they are not aware of, using bare hands could be dangerous for them, too.

In order to avoid the potential inaccuracy and potential danger caused by using bare hands throughout the lab, the use of tweezers or maybe even disposable gloves is recommended. By using tweezers to submerge and take our the metal strip, experimenters can avoid direct contact with both the

solutions and the metal strips, and by cleaning the tweezers after each trial using tap water and paper towel, the chance of solutions get mixed is reduced.

The second shortcoming can also lead to invalid results because by using the same emery board for scrubbing all metal strips, unwanted metal atoms of one metal could be transferred onto/into another metal strip and/ solution, which could effect the chemical reaction. For example, after the reaction of magnesium and iron(all) nitrate, magnesium strip was scrubbed using the emery board and placed on the paper towel. The reaction carried out next was the reaction of copper (II) and zinc nitrate.

According to the procedure, the copper strip has to be scrubbed before use, atoms may be transferred from the emery board onto the copper strip. Compare to the other metals used in this investigation, magnesium has the highest metal reactivity among the three. However, even there should be no reaction happens between copper (II) and zinc nitrate, but because of extra magnesium atoms were transferred onto the copper strip, the prediction of no reaction may not be supported y what really happens since magnesium reacts vigorously with zinc nitrate.