

Electrolysis DCI thoughts

Issues:

We are plating out amounts that should be expressed in moles not grams. The other issue is that particular metal ions need particular number of electrons.

Think about what the student sees

Describe the change in amount of metal on each electrode. How are these changes related?

What flows from the + electrode in the external circuit via the wire?

What causes the direction of the flow?

What flows from the + electrode in the solution?

What is the mechanism that transfers the amount of metal from one electrode to the other?

Describe the action that causes the metal ions to plate on to the - electrode.

At the -electrode it is clear that Fe^{2+} needs two electrons to produce a Fe atom and plate out. If the solution is composed of a different 2+ metal ion the same number of electrons plates out the same number of atoms of that metal. If the metal ion is a +1 charge then compared to a metal with a +2 charge assuming the same number of electrons are flowing that more atoms of a +1 charge ion will plate out compared to a +2 charged ion. So there is an inverse relationship between the number of atoms plated and the charge on the metal ion. So if Cu^{2+} is in solution at 3 amps for 10 mins could predict if the mass of Cu plated out is greater, less than or the same as the mass of Zn plated out. Explain your prediction. Want to hear is that Cu has a smaller molar mass compared to Zn. (Do the experiment.) Can predict the mass of Copper that plates out?

Ways to do this:

$$\frac{65.38}{63.55} = \frac{0.61 \text{ g}}{x \text{ g}}$$

$$\frac{65.38 \frac{\text{g}}{\text{mol}}}{63.55 \frac{\text{g}}{\text{mol}}} = \frac{0.61 \text{ g}}{x \text{ g}}$$

$$0.61 \text{ g Zn} \left(\frac{1 \text{ mol Zn}}{65.38 \text{ g}} \right) \left(\frac{1 \text{ mol Cu}}{1 \text{ mol Zn}} \right) \left(\frac{63.55 \text{ g}}{1 \text{ mol Cu}} \right) = 0.59 \text{ g}$$

both Zn and Cu require two electrons are being transferred