Edexcel Chemistry International A Level

CP2 - Determination of the Enthalpy Change of a Reaction using Hess's Law

Flashcards

What is Hess' Law?

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The enthalpy change for a reaction is independent of the route taken.

An investigation into the enthalpy change for the thermal decomposition of potassium hydrogencarbonate is conducted. What safety precautions should be taken?

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- Wear safety goggles.
- Avoid skin contact with hydrochloric acid or potassium carbonate as both are irritants.
- Clear up spillages and broken glassware immediately.

Why can’t the enthalpy change for the decomposition of potassium hydrogencarbonate be measured directly?

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The reaction takes place at high temperature and requires heating. The enthalpy change can not be measured directly because you have to take into account how much energy was put into the reaction in the first place.

During an enthalpy change investigation, a burette is used to measure the volume of acid before the reaction. Why?

During an enthalpy change investigation, a burette is used to measure the volume of acid before the reaction. Why?

A burette is much more accurate and has a higher resolution compared to a measuring cylinder.

Write a balanced symbol equation for the thermal decomposition of $KHCO_3$

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$2KHCO_3(s) \rightarrow K_2CO_3(s) + CO_2(g) + H_2O(l)$

What is meant by the terms endothermic and exothermic?

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Endothermic - a reaction which takes in energy from the surroundings.

Exothermic - a reaction which releases energy into the surroundings.

What happens to the temperature of the surroundings during an exothermic reaction?

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Surroundings temperature increases

Is enthalpy change positive or negative for endothermic reactions?

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Positive

What equation links the amount of heat transferred to / from a substance, mass and temperature change?

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$q = mc\Delta T$

q - amount of heat energy (J)

m - mass of solution (g)

c - specific heat capacity

ΔT - temperature change (°C or K)

How can enthalpy change per mole be calculated using q?

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$\Delta H = - q/n$

ΔH - enthalpy change (J mol^{-1})

q - amount of heat energy transferred to/from a substance (J)

n - amount of substance (mol)

Describe an experiment that can be conducted to investigate the enthalpy change for the thermal decomposition of potassium hydrogencarbonate

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1. Weigh 3 g of potassium carbonate into a test tube.
2. Use a burette to add 30 cm^3 of 2 mol dm^{-3} hydrochloric acid to a polystyrene cup in a beaker.
3. Measure the initial temperature of the acid.
4. Add the potassium carbonate to the cup. Continually measure the temperature and stir. Record the highest temperature reached.
5. Weigh the empty test tube.
6. Use the equation $q=mc\Delta T$ to calculate the enthalpy change.

The enthalpy change of a reaction is being investigated. What are the possible sources of error?

The enthalpy change of a reaction is being investigated. What are the possible sources of error?

- Heat loss to the surroundings.
- The heat capacity of the solution is generally assumed to be the same as water.
- Incomplete reaction.

How can heat loss be reduced when using a coffee-cup calorimeter?

How can heat loss be reduced when using a coffee-cup calorimeter?

- Use a polystyrene cup.
- Use a lid.
- Place the cup in a beaker filled with cotton wool.