Assay of Magnesium Hydroxide

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❑ Introduction

Magnesium hydroxide ($Mg(OH)_2$, m. wt. = 58.32) is white or almost white, fine, amorphous powder that may contain magnesium oxide and magnesium sulphate as well. It is practically insoluble in water but dissolves in dilute acids. Its solution in water is alkaline.

Magnesium hydroxide is an antacid that is given orally (commonly known as *milk of magnesia*). It is also given as an osmotic laxative. Magnesium hydroxide has also been used as a food additive and as a magnesium supplement in deficiency states.

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❑ Chemical principle

Assay of magnesium hydroxide follows acid-base reaction in which a standard acid is used.
Since magnesium hydroxide is practically insoluble in water, direct titration is not possible. Thus, *back* or *residual titration* is employed.

Back titration is accomplished by dissolving the substance under estimation in an accurately measured excess quantity of a standard solution of known strength, and subsequently titrating the excess of the latter with another previously standardized solution.

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❑ Chemical principle

Magnesium hydroxide is to be dissolved in excess of 1 *N* sulphuric acid and the unreacted excess of this acid is to be back titrated against 1 *N* sodium hydroxide solution:

$$H_2SO_4 + Mg(OH)_2 \longrightarrow MgSO_4 + 2H_2O$$

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

(excess, unreacted)

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❑ Applications of back titration

Back titration is usually carried out when the substance under estimation:

a) **is insoluble in water (*e. g.*, magnesium hydroxide and calcium carbonate; which require excess of the standard solution to be solubilized).**

b) **fails to give a sharp end point with the indicator used in direct titration.**

c) **is volatile (e. g., ammonia; some of which would be lost during the titration).**

d) **reacts rapidly only in the presence of excess of the standard solution (e. g., aspirine and lactic acid).**

e) **decomposes when heated with the standard solution (e. g., formaldehyde; heating is required during titration).**

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- **Procedure**

Dissolve your sample in 30 ml of distilled water and 20 mL of 1 *N* sulphuric acid. Add 2 drops of methyl-orange solution as the indicator (pink) and titrate against 1*N* sodium hydroxide solution until reaching the end point (yellow).

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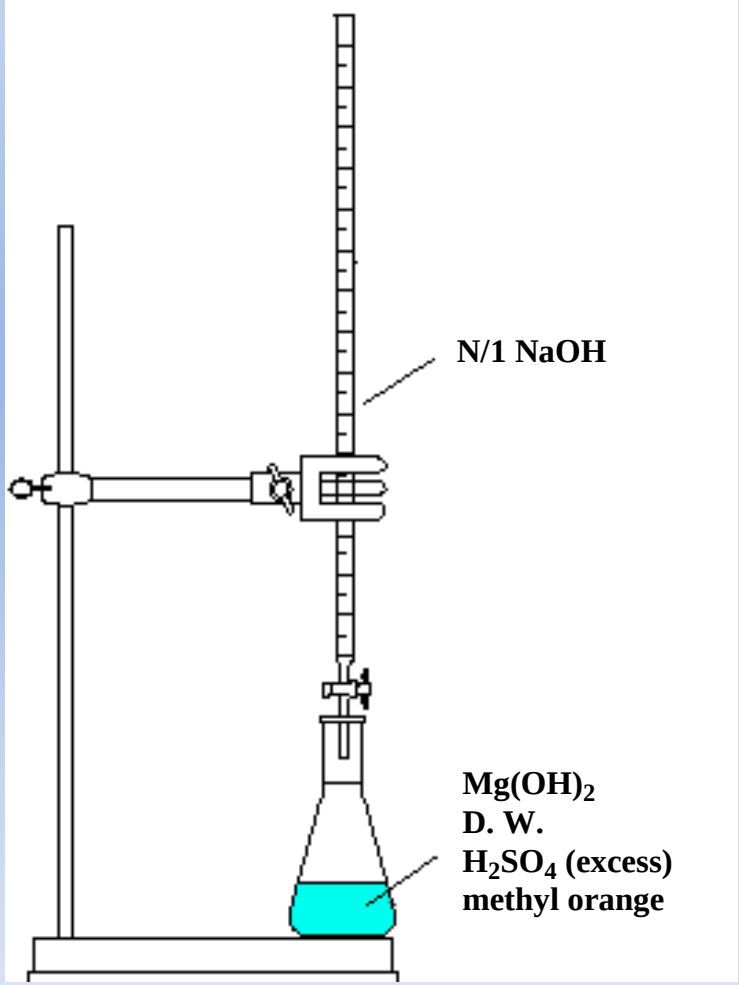
- **Titration apparutus**



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❑ calculations

➢ **calculate the chemical factor:**

(each 1 mL of 1 *N* sulphuric acid solution is equivalent to 0.02916 g of magnesium hydroxide)

➢ **correct the volumes of NaOH and H_2SO_4 solutions used into *N*/1 volume:**

***V_1* is the volume of H_2SO_4 added**

***V_2* is the volume of NaOH reacted with the excess H_2SO_4**

***V_1 – V_2 = V_3* the volume of *N*/1 H_2SO_4 consumed by the unknown**

➢ **calculate the quantity of magnesium hydroxide present in your sample:**

$$wt. = V_3 * \text{chemical factor}$$