INVESTIGATION OF WATER ABSORPTION PROFILE OF MINERAL WOOL INSULATION

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INTRODUCTION

This study is targeted at investigating the water absorption capacity of mineral wool insulation in order to understand its behaviour and contribution towards the occurrence of corrosion under insulation in industries. It is caused by the intrusion of moisture or condensation of water beneath the insulation. Parameters such as change in pH and thermal treatment were assessed in order to ascertain the performance of mineral wool when insulated on a substrate. The amount of water penetrating the surface of insulated asset reflects the performance of insulation materials.

OBJECTIVES

1. To determine the water absorption behaviour of mineral wool insulation.
2. To investigate the effects of thermal treatment of mineral wool as well as pH on the water absorption.

MATERIALS AND METHODS

Mineral wool (MW)

Thermal treatment

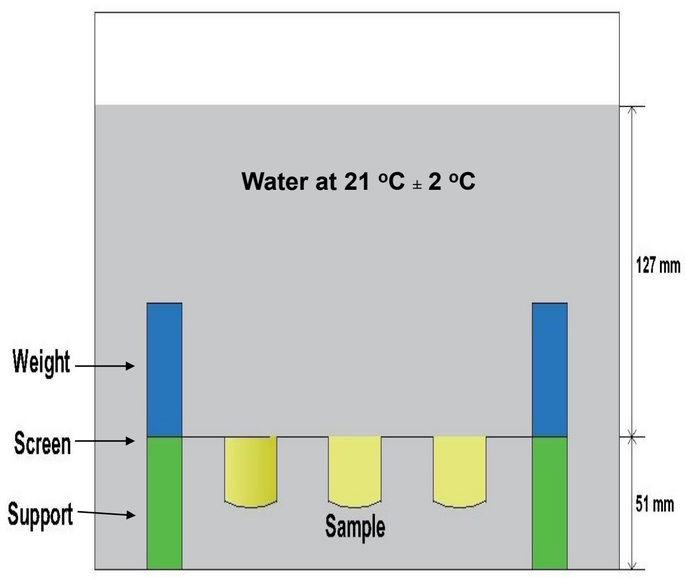
oven

Thermal treatment at 50, 150 and 250 ^{o}C

Thermally treated MW

Chemical composition of mineral wool (3)

Chemicals present	Composition (% by weight)
SiO_2	35-60
Al_2O_3	12-27
CaO	0-35
MgO	0-30
Na_2O	0-17
K_2O	0-17
R_2O (Na_2O + K_2O)	10-17
P_2O_5	0-5
Fe_2O_3	0-20
B_2O_3	0-8
TiO_2	0-3



Parameters investigated

- **Effects of pH:** Pre-weighed mineral wool insulation was submerged in distilled water in which the pH was adjusted with 1.0 M sulphuric acid and1.0 M NaOH from 3.51 to 9.12. The final weights were recorded after every 15 minutes.
- **Thermal treatment of the insulation**: Mineral wool samples were preheated at different temperatures (50 ^{o}C, 150 ^{o}C and 250 ^{o}C) for 3 h and then fully immersed in water; the difference in weight before and after immersion every fifteen minutes was determined.

Fig. 2: Methodology of water absorption of Mineral wool insulation(1)

RESULTS

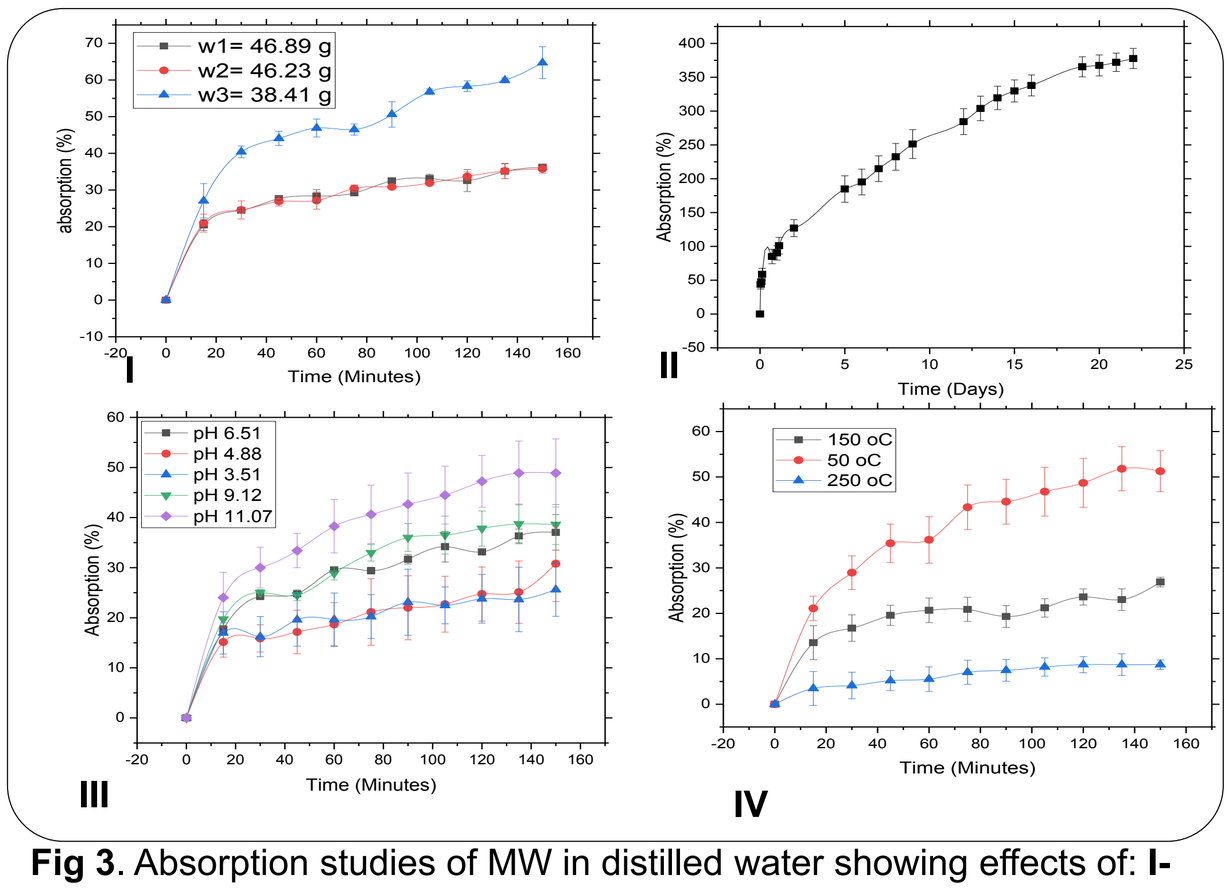


Fig 3. Absorption studies of MW in distilled water showing effects of: **I-** initial dry weights, **II-**long term exposure , **III-** pH, **IV-** Thermal treatment.

- There is rapid water absorption within the first fifteen minutes.
- The water absorption tends to increase as pH increases with highest absorption observed in alkaline medium.
- When mineral wool is subjected to various temperatures, the water absorption is observed to increase as temperature decreased.

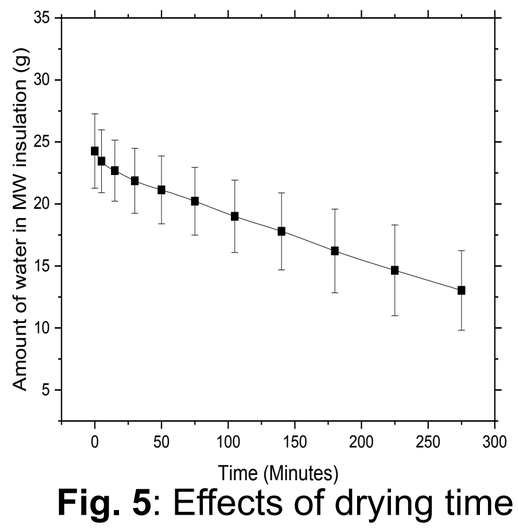


Fig. 5: Effects of drying time

- The rate at which the absorbed water dries at room temperature (19.1 ^{o}C) was slow with about 15 % of water removed within the first 80 minutes.

CONCLUSION

The water absorption capacity of mineral wool was observed to increase within the first fifteen minutes showing significant absorption when exposed to moist environment. This property was observed to increase with increasing pH and decrease when the insulating material was subjected to thermal treatment up to 250 ^{o}C.

REFERENCES

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