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Influence of Sulphate Crystals Grown by Solution Technique

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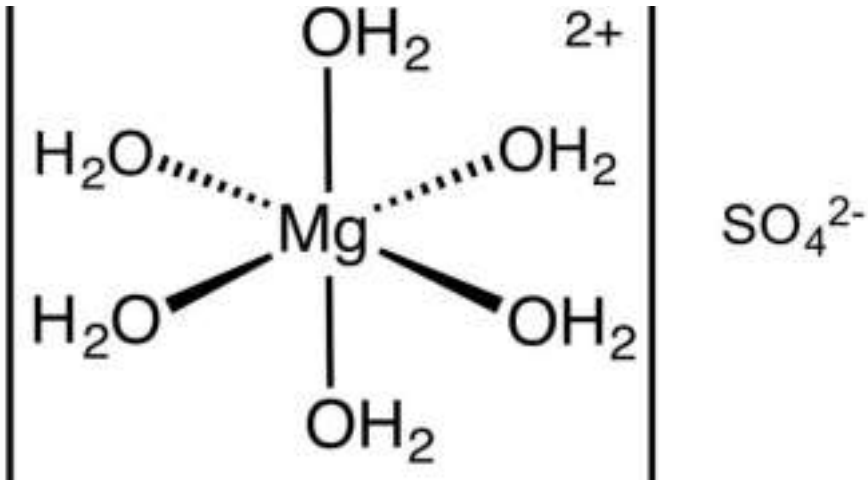
ABSTRACT: - Different Sulphates and mixed of the crystals have been successfully grown with the help of slow evaporation technique. The duration of the growth time is checked and it is noticed that there is a difference in the growth time of $MgSO_4$ and $NiSO_4$ Where as the growth time of $FeSO_4$ and $NiSO_4$ is the same. But all of them differ in size. Interestingly the combination of these three are having the same growth of time and all are semi transparent. Yet, they differ in size.

Keywords – Crystal Growth, Evaporation Technique, Magnesium Sulphate.

I. INTRODUCTION

-Magnesium Sulphate: it is an inorganic salt which is usually called as Epsom or Bitter salt. They are odorless and are insoluble in acetone and somewhat soluble in alcohol. Magnesium Sulphate has a chemical formula as $MgSO_4$ and it appears as white crystalline solid.

Epsom salt has been conventionally used as a component of bath salts and can also be used as a beauty product. It is used by gardeners to improve crops and by athletes to soothe sore muscles. Magnesium sulphate is used in industries as pigments, fillers, bleaching agents, agricultural chemicals, processing aids, etc. It also can be used in our day-to-day life as paper products, personal care products, laundry and dishwashing products, lawn and garden care products, agricultural products, etc. Interestingly the global annual usage of the monohydrate was 2.3 million tons during 1970s and of which the major part was used in agricultural fields.



-Nickel Sulphate: It is also known as Nickelous sulphate, having IUPAC name as Nickel(II) sulphate. They are odorless and are insoluble in ethanol and acetone but soluble in alcohol. Nickel sulphate has chemical formula as $NiSO_4$ and it appears as blue crystals.

All Nickle sulphates are paramagnetic. Columns used in polyhistidine-tagging, useful in biochemistry and molecular biology, are regenerated with nickel sulphate. They are used in industries as intermediates, iron exchange agents, planting agents and surface treating agents.

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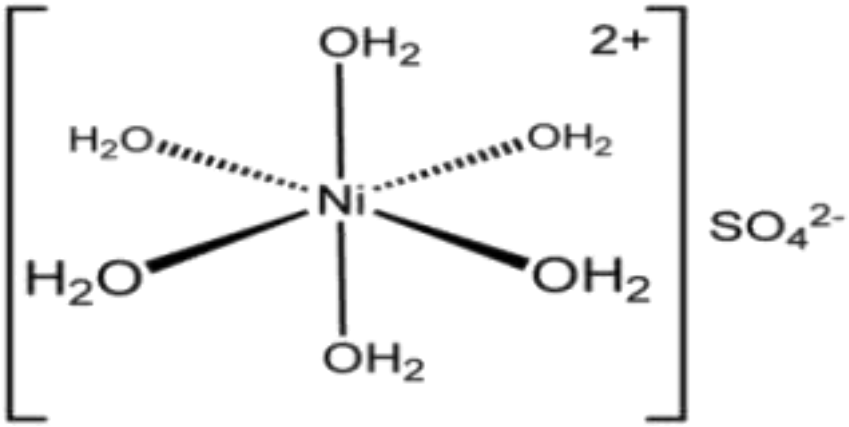
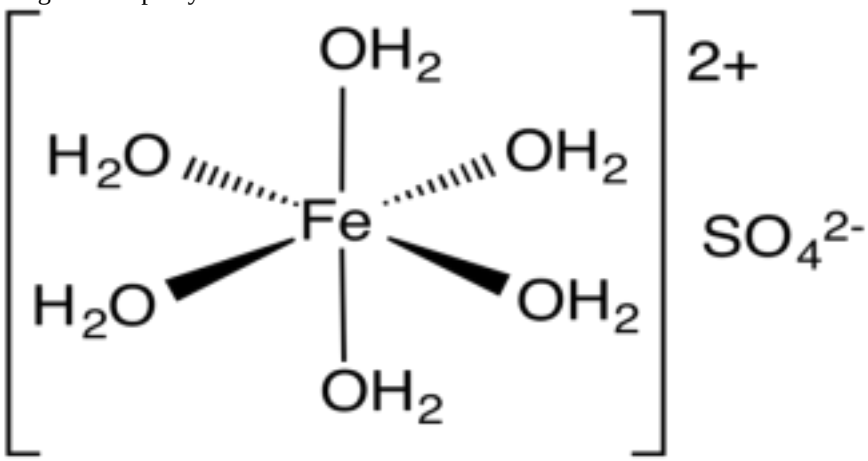


-Ferrous sulphate: It is also known as green vitriol and has IUPAC name as iron(II) sulphate. It is odorless and insoluble in alcohol. The melting point of $FeSO_4$ is 60-64 °C .

The hydrated form is used for industrial applications and medically, to cure deficiency of iron. The blue-green heptahydrate known as copperas and green vitriol since ancient times is the most common form of this material. It is used in industries as agricultural chemicals, intermediates, pigments, solids separation agents etc. It also has consumer uses such as paints and coatings, water treatment products etc.



II. EXPERIMENTAL PROCEDURE

In order to grow $MgSO_4.6H_2O$, $NiSO_4.6H_2O$, $FeSO_4.6H_2O$ and mixed of these three crystals by using slow evaporation method; 320g of magnesium sulfate, 430g of nickel sulfate and 110g of ferrous sulfate were taken separately in 300ml double distilled water to make super saturated solution.

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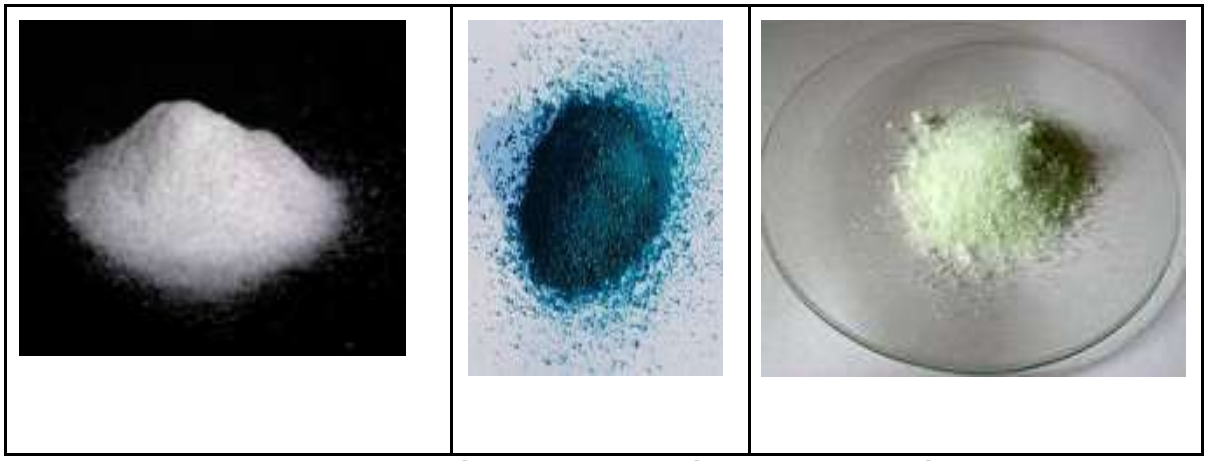

Fig.1- $MgSO_4$ powder Fig.2- $NiSO_4$ powder Fig.3- $FeSO_4$ powder

Magnetic stirrer was used to achieve super-saturated solution at ambient temperature. Then the solution was filtered by a filter paper, this was done to remove all the physical impurity of the solution and this solution was used to make seeds. After 2-3 days the seeds appeared on the dish and after 8- 9 days the seeds were removed from the dish. The seed crystals of all the three sulfates were suspended in super-saturated solution and for doping the super-saturated solutions were mixed as

75ml $NiSO_4$ with 75ml $MgSO_4$, 75ml $NiSO_4$ with 75ml $FeSO_4$ and 75ml $MgSO_4$ with 75ml $FeSO_4$. These crystals were also suspended into mixed super-saturated solutions forming different combinations and these combinations of seeds were suspended in silent place without any kind of disturbances. After 25-30 days the crystals of $MgSO_4$, $FeSO_4$, $NiSO_4$ and mixed crystals were obtained by solution evaporation method.

III. RESULT

The crystals of $MgSO_4$, $FeSO_4$, NiSO4, $MgSO_4$+$NiSO_4$, $NiSO_4$+$MgSO_4$, $MgSO_4$ & $NiSO_4$ were successfully grown.

No.	Crystal	Growth time	Size(cm)	Result
1.	MgSO4	26 days	4.6×0.7×0.7	Transparent
2.	FeSO4	29 days	1.2×0.5×0.9	Transparent
3.	NiSO4	29 days	2.1×0.6×0.6	Opaque
4.	$MgSO_4$ +NiSO4	30 days	2.6×0.6×0.5	Semi transparent
5.	$NiSO_4$ + MgSO4	30 days	3.3×0.8×0.6	Semi transparent
6.	$MgSO_4$ & NiSO4	30 days	2.6×0.6×0.5	Semi transparent

IV. CONCLUSION

1. The size of the crystal was large in short time period when it was grown in its pure solution. 2. The size of the crystal was small in large time period when it was grown in mixed solution.
3. Nucleation is more in pure solution of that particular material so that crystals are transparent as compared to the crystals in mixed solutions.
4. Nucleation of mixed material is less in the mixed solution because of the change of bonds in the mixed solution.
5. Both $FeSO_4$ and $NiSO_4$ have same growth time but they differ from each other in size and transparency.

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