

PREFACE

For the last few decades synthetic single crystals of various substances have gained increasing practical importance, often for scientific investigations but principally for technological and Industrial application. Hardly any solid state physical Investigation is made now-a-days without an attempt to use well controlled single crystals. There are still obvious problems where research would benefit by the availability of crystals which have so far not been grown at all or at least not in right or with sufficient purity this thesis describes detailed studies made on the growth of single crystals of KClO_4 and NaCl in silica gel by changing a variety of parameters. The study also includes the characterization of the grown KClO_4 and NaCl single crystals by single beaker, test tube U-tube and new techniques.

From the Literature it is known that there is a good number of publication on the gel growth of a variety of single crystals which are being used for their electrooptical studies. However there is little data available regarding the detailed studies on the gel growth and characterization of KClO_4 and NaCl single crystals. These crystals are useful for basic studies of their electronic, optical and other pertinent characteristics.

Hence the present work has been undertaken.

Since the thesis deals with growth of crystals in gels a brief survey on the growth of various single crystals using different growth methods has been given in Introductory chapter [Chapter 1].

As the thesis deals with the growth of KClO_4 and NaCl crystals in silica gel, gel preparation, properties gelling mechanism and structure of silica Hydrogel have been described in Chapter 2.

Considering the various applications of single crystals, a systematic work has been carried out to grow calcium sulfite single crystals. Prdiminary experimental results on the growth of KClO_4 crystals using beaker, test tubes and U-tubes are given chapter 3.

The effect of gel density, gel pH, concentration of feed solution, gel ageing intermediate neutral gel and growth of these crystals has been studied in detail and the results are presented in chapter 4. It has been observed that while high density and high pH gels have been found to produce opaque crystals, good quality single crystals have been obtained in Low density and low pH gels. It is observed that the intermediate neutral gel column and ageing considerably reduce the number of nucleation sites.

A single procedure to control nucleation sites in gels has been adopted which has resulted an increase in the size of the crystals.

Studies on the growth of single crystal of NaCl in silica gel also described in this chapter about the growth of single crystals using various gel growth methods. effects of acid impurities on nucleation and growth of NaCl single crystals are given in chapter 5. It has been found that foreign impurities such as H_2SO_4 , HCl, HNO_3 , CH_3COOH and $HClO_4$ acids in small amounts added with a view to modify the initial characteristics of the growth medium helped to suppress the nucleation density and improve the quality of the crystals. The crystals grown in silica gel with $HClO_4$ and HNO_3 impurities were quite flawless with well defined edges and faces and upto a maximum size of about five times larger than the ones obtained without impurities. It has also been observed that, with acid impurity the number of Liesegang rings reduces and more transparent single crystals were obtained.

The general conclusion drawn from these studies and the scope for the further work in gel growth are presented in chapter 6.



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