Hypothesis and methodology:

The NLO (non-linear optical properties) of various iodate crystals is very important. In the recent year this prominent NLO behavior is studied by growing iodates of alkali, transition and alkaline earth material. If Iodides are thought, it must be emphasized that they have various practical use in medical science, that is Iodide can be use to treat patients with hyper-thyroid due to its ability to block the release the thyroid hormone (TH) as wolf-chaik off effect from thyroid glands.

In large doses inhibits proteolysis of thyroglobin this permits TH to be synthesized as a stored and cooled but not release into blood system. Iodide also used to multi cellular process, It supplies oxygen to plant, vegetables and fruit trees. It will be interesting to study particular Iodide in crystalline form.

It is also reported that sulphides are semiconductor in nature the synthesis of sulphides is complicated because of relatively low vapour pressure of the sulphur, nevertheless successively more attention is being turn towards investigating sulphides of various materials. There is no need to explain the role of semiconductor in the development of present electronic industries & semiconductor devices for e.g. Cadmium sulphide [cds], which is used in photocell & lead sulphide and used in infra, red sensors, Zink sulphide (Zns) used for lenses and other optical devices.

If material, copper, is thought, it is known that copper and compounds has a widespread use in a range of applications.

It is used to make electrical products and electronics in electric generators and motors, electrical power and lighting fixtures. Electrical wiring, radio and television sets, computers, air conditioning systems and other electrical appliances.

In building construction, equipment and heating, chemical and pharmaceutical manufacturing Copper iodate, iodide and sulphide will be grown using following chemical reactions.
The chemical reaction taking place can be represented as

\[ AX + BY = AY \downarrow + BX \quad \rightarrow \]

Where A and B are cat ions while X and Y are anions.

E.g. If we want to grow the crystals of copper iodate and copper iodide and sulphides

\[ \text{CuCl}_2 + 2\text{KIO}_3 \rightarrow \text{Cu(IO}_3\text{)}_2 \downarrow + 2\text{KCl} \]

OR

\[ \text{Cu(NO}_3\text{)}_2 + 2\text{KIO}_3 \rightarrow \text{Cu(IO}_3\text{)}_2 \downarrow + 2\text{KNO}_3 \]

AND

\[ \text{Cu(NO}_3\text{)}_2 + \text{KI} \rightarrow \text{CuI} + \text{KNO}_3 \]

OR

\[ \text{CuCl}_2 + \text{KI} \rightarrow \text{CuI} + \text{KCl} \]

AND

\[ \text{CuCl}_2 + \text{H}_2\text{S} \rightarrow \text{CuS} + 2\text{HCl} \]

In this method an aqueous solution one reactant component used.

**Scope of the study:**

Copper crystals have very large and different applications. Iodates and Iodides are mainly used in veterinarian’s products of variable doses. Such grown crystals are useful in medicine, in electronics, piezoelectric technology and fabrications of newer crystal materials in devices and technology.

Growth of crystals has become the heart of the research due to various applications of the crystals. The development of the newer and better techniques of growing large crystals and control of nucleation remains as open field to research, a lot of work remains to be done to explain the detailed nature of the gel structure.

Copper crystals have wide applications. Iodide, iodates and sulphides different metal in the growth of copper is also the one area to study the changing properties of doped grown crystals.
compared to undoped crystals. Also to study the other properties of grown crystals, which will be helpful for fulfilling the industrial requirement related to the copper crystals.

Utility of the study:

It is used in pigments and dyes, electroplated protective coatings, insulation for liquid fuels, coins, cement, Food and drugs, metallurgy, nylons, insecticides, herbicides and fungicides, pollution control devices, printing and photocopying and photo graphics, pyrotechnics and word preservatives and timber treatments.

It is also used to manufacture antifouling paints, electrolysis and electroplating processes, fabrics textiles, flame proofing materials, glass and ceramics.

Copper forms many alloys as bronze (with tin) brass (with zinc) and Monel metal (with nickel) also used in variety of industries.

In agriculture copper (II) sulfates used in Bordeaux and Burgundy mixtures on the farm for the control of fungus diseases.

Copper (II) oxide is used in the ceramic industry for imparting blue, green or red tints in glasses, glazes and enamels.

In petroleum industry uses copper (I) chloride in their oil sweetening process.

Hence it is decided for "extensive study of highly electrical conducting copper metal by growing its crystals of lodate, Iodides & sulphides".

There are several methods for growing the crystals, crystals can grown by following methods.

1. Solution method.

2. From melt.

3. From evaporation method

4. From any two combination of above three

Each method of crystal growth has its own merits and limitations. Gel method
is one of the solution growth methods. The gel method is relatively simple and economical but demands great patience and vigilance for its successful use.

The growth of crystals in gel can take place at ambient temperature. The gel technique is most convenient and suitable for the growth of the crystal of the materials

1. Which decomposes before their melting point
2. For the product substance which is insoluble or sparingly soluble in water
3. And the substances which do not have proper solvent for re-crystallization.

Gel technique is very simple as it can take place at ambient temperature. It does not require any power. Suppression of nucleation is the special property of gel technique; hence it is decided to grow crystals of

I. Copper iodate
II. Copper iodide
III. Copper sulphides by gel technique

**Limitations:**

1. The crystal size is generally small.
2. The growth period of crystal is very slow
3. Duration in growing of crystal is different; it is depend on atmospheric seasons like winter and summer.
4. In some crystals the gel trapping during the growth occur, when a Silica gel is used