SYNOPSIS

GROWTH AND CHARACTERISATION OF CERTAIN ORGANIC CRYSTALS

The thesis presents the results of the investigations on the crystallisation behaviour, defect structure and electrical properties of certain organic crystals—phthalic anhydride and potassium acid phthalate.

Hollow crystals of phthalic anhydride were grown from vapour. The morphology of these hollow crystals were studied in detail and a mechanism for their growth has been proposed. A closed crystal-vapour system was used to study the basal plane growth of the whiskers and the sequential growth observed, confirmed the mechanism suggested for hollow crystals. The dendritic crystals of phthalic anhydride were grown, both from the melt and solution. The observed morphologies of these dendrites are described.

Spherulites of phthalic anhydride have been grown by the artificial initiation of nucleation, from melt and solution. The variation of the substructure of these spherulites with the growth temperature was investigated. The spherulitic films having ribbon substructure were etched to reveal dislocations. A mechanism for the formation of the observed etch
pattern has been suggested. The slip occurring in these ribbons were studied and the results are presented.

Large single crystals of phthalic anhydride were grown by the Bridgman method. The shape of the growth tube, pull rate and temperature profile suitable for growing good single crystals were determined by trial and error. Potassium acid phthalate single crystals were grown from aqueous solutions. The addition of thiourea has been found to promote growth in the \( <001> \) direction.

Phthalic anhydride crystals were cleaved along the \( \{110\} \) planes and cut perpendicular to it. The potassium acid phthalate crystals were cleaved along the \( \{001\} \) plane and cut into slabs having \( \{010\} \) and \( \{100\} \) faces. The cleavage surfaces of phthalic anhydride and potassium acid phthalate crystals were examined by optical techniques and surface topography has been studied.

Of the various etchants used, \( \text{NH}_4\text{OH} : \text{H}_2\text{O} \) in the ratio 1 : 3 by volume have been found to delineate dislocations on the \( \{001\} \) and \( \{110\} \) surfaces
of phthalic anhydride. The morphology of etch pits on these faces have been studied in detail and the dislocation densities on them have been determined. On potassium acid phthalate cleavage surfaces, an etchant consisting of one part of water in five parts of acetone by volume was found suitable to reveal the dislocations. The dislocation configurations on these crystals have been examined by successive etching. The effect of annealing on these crystals has been discussed in the light of the observed dislocation configurations. Pyramidal indentations were made on the different faces of these crystals and the slip traces observed were used to identify the slip planes.

The anisotropy of electrical conduction in phthalic anhydride and potassium acid phthalate single crystals were investigated by measuring the conductivity in the various directions at different temperatures and the activation energies have been calculated.