

PIEZOELECTRIC RELAXATION IN CRYSTALS CONTAINING POINT DEFECTS

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Received December 30, 1968

ABSTRACT

The phenomenon of piezoelectric relaxation in crystals has been dealt with briefly by applying group theoretical methods. Three typical crystal classes which are capable of exhibiting piezoelectricity are considered in some detail and a study is presented of the possible piezoelectric relaxation when different defect complexes are introduced in the crystals. The concept of an anisotropy in piezoelectric relaxation has been brought out in a crystal class belonging to the orthorhombic system.

1. INTRODUCTION

LATTICE imperfections in crystals, such as point defects, are known to cause relaxation effects in their electrical and mechanical properties. For instance, when an external electric field is imposed and removed, relaxation occurs. This can be accounted for by stating that a set of lattice sites which are initially equivalent and each of which thus offers the same probability of occupation by a vacancy, become inequivalent in the presence of an external electric field and permit of departures from the equilibrium probability distribution. When the external field is removed, the returning of this disturbed probability distribution to the equilibrium one takes time and is described as a relaxation. Instead of the disturbance being caused by an electric field as in the foregoing example, we can conceive of it being caused by the application of a stress to the crystal. When the stress is removed, the sites which had become inequivalent return to the state of equilibrium but will again take time to do so and relaxation occurs.

In the example cited first, the two physical quantities involved are the electric field and electric moment, the physical property we are dealing with is dielectric polarisation and we observe dielectric relaxation. In the second example, the physical quantities are stress and strain, the physical property

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