PREFACE

Ultrasonics is a powerful technique for inspecting and characterizing industrial materials. It can not only used to detect bulk and surface flaws, but obtain information on material microstructure also which determine the engineering properties, such as elastic moduli and ultimate strength. However, traditional Ultrasound requires liquid or contant coupling for its generation and detection, making it difficult or impossible to apply in many industrial situations. This occurs in particular on curved parts at elevated temperature, a situation is widely found in industrial products and during the processing of industrial materials.

Ultrasonics is well recognized to be a powerful non invasive diagnostic technique. Everyone is familiar with its use in the medical field, particularly to observe a fetus in the womb of his mother. Its use for imaging through opaque materials, particularly to find flaws like cracks, disbands or delaminations is also well known and uses the same principle and technology as the one used in the medical field.

The present work is an effort at sifting the earlier literature to watch what questions remained unreplied and what gaps are to be fulfilled in the work done by previous investigators who have contributed to the understanding of
investigators who have contributed to the understanding of Ultrasonics and Anharmonic Properties of Solids. The present work spreading over 5 Chapters aims at answering and explaining some of those problems on Ultrasonics and Anharmonic Properties of Solids through a multipronged approach in dealing with different problems.

A general discussion about Present Status and Future Aspects of Ultrasonics is given in Chapter 1. An effort has been made for obtaining higher order elastic constants for alkali cyanides starting from nearest neighbour distance and hardness parameter assuming Coulomb and Börn-Mayer potentials in Chapter 2. The higher order elastic constants data at room temperature are used in discussion of the anharmonic properties of alkali cyanides. A comparison has been made between theoretical and experimental studies.

An attempt has also been made for obtaining higher order elastic constants of crystals which consist of divalent ions and possess face centered cubic crystal structure. The theory concerning with anharmonic properties of Stanus Selenide (SnSe), Stanus Telluride (SnTe) and Bismuth Telluride (BiTe) starting from primary physical parameters and assuming long range Coulomb and short-range Börn-Mayer potentials is given in Chapter 3.
A qualitative discussion of Ultrasonic propagation parameters measuring techniques for liquids and solids with their relative merits, drawbacks and accuracy is given in Chapter 4. Some Conclusions related with the present study are given in Chapter 5. Suitable Computer programs for present work are designed and appended.

The author has tried to explain several properties and to solve various problems through the Ultrasonic propagation parameters in the light of conclusions drawn from the present theory. While some questions remained un replied, some suggest solution and some still pose newer questions.