SUMMARY

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The burning problem of present world is to investigate the additional sources of energy to cope up the ever growing demand of energy of the modern society. The sources available like coal, gas, petroleum etc. are not found sufficient and realized to be consumed latest by 2080. The scientists and engineers have envisaged and started producing usable energy from wind, sun and nucleus of the atom. The nuclear power reactors are used for large scale generation of electrical power, propulsion of automobiles, submarines, ships and aeroplanes. Besides this, the nuclear power reactors are also used to produce radio isotopes and other radiation sources which are utilized in peaceful and constructive applications, such as; Medicine, Health physics, Radiological and Clinical laboratories, Agriculture, Metallurgy, Industry and Research. In all the nuclear reaction applications, the professional workers are continuously exposed to the radioactive materials and receive a harmful dose from the invisible ionizing radiation. This radiation exposure is very harmful to human being and it leads to dangerous diseases like cancer, deleterious genetic effects in the subsequent generation etc. Therefore, in all modern nuclear applications, the prime importance is given to the detection and quantitative estimation of radiation doses. Which facilitate radiation users to make appropriate use of radio isotopes and radiations and to decide

the precautionary measures against the adverse effect of radiation exposure to the professionals and individuals.

The health physicists have put a lot of efforts in this direction and developed active [the ionization chambers, scintillators, G.M. counters etc.] and passive [photographic films, chemical systems and thermoluminescent dosimeters etc.] dosimetric systems. Among these, the passive system, particularly thermoluminescence dosimetry (TLD) system is found to be the most accurate, cheapest and quickest technique of radiation detection and dose estimation. Many people suggested alkali-halides, $CaSO_4$, Al_2O_3 etc. for the fabrication of the solid state radiation dosimeters. Among the researchers in the field of alkali halides, very few or none developed NaF as a TL dosimeter material. Therefore, the chief objective of the present work of the thesis is to examine the suitability of pure and K^+ doped NaF as solid state dosimeter material.

The examination of TL characteristics of pure NaF and NaF:K under the different chemical and physical conditions clearly indicated that the TL behaviours are influenced by the two important factors; (i) thermal pre-treatment of the specimen, and (ii) concentration of the impurity in the specimen. It is observed that the pure NaF displays peaks at 120 and 360°C temperature. The pre-heat treatments and/or introduction of monovalent cation impurity K^+ change the glow curve pattern and peak temperatures. The specimens of NaF and NaF:K (1000 ppm), annealed and air-quenched from 400°C, designated respectively as NaF(T) and NaF:K(T), have been found to display intensed TL output with the well defined and isolated peaks at 150 and 165°C respectively. The detailed study of the dosimetric properties of these peaks reveals the fact that NaF:K(T) material is suitable for its use in TL radiation dosimetery.

The thesis is divided mainly in to five chapters. The first and second chapter respectively describe the introduction to the present work and brief account of Luminescence and its applications in general. The brief account of radiations, their hazards and units are described in chapter 3-A. Since the beta-radiation is used for excitation in the present experimental work, the special information regarding beta radiation is given in chapter 3-B. Chapter four describes the experimental techniques involved in the present work. The results and discussions form the chapter five. This is followed by the conclusions drawn from observed experimental results. The thesis ends with the list of references.