PREFACE

The thesis is a report of experimental investigation carried out by the author in the research laboratory department of physics, Yuvaraja’s College, University of Mysore, Karnataka, India, during the period 2010-2016.

Water plays a very important role for the existence of life on this planet. It is one of the constituents of “Pancha Bhuta”. The quality of life we lead depends on the quality of air we inhale and the water and food we consume. The pollution of any one of these leads to many diseases. The pollution or contamination may come from manmade or natural sources. Animals and plants are also victims of these contaminations. The present study is an effort to identify and understand the factors responsible for the contamination of ground water and surface water. The major source of contamination for ground water comes from dissolved radionuclides, such as radon and radium present in earth’s crust. The area of study is concentrated towards areas surrounding by granitic rocks. That is the reason for choosing granitic region such as Tumkur, Ramanagar and Bangalore districts for the study.

Water quality is an important parameter in environmental studies. According to World Health Organisation (WHO), water causes nearly 80% of the diseases in human beings. The solid aquifers or rocks known as geological materials usually contain the trace of some radioactive elements such as uranium, thorium, radium decay series and non-decay series of $^{40}$K, which may dissolve into groundwater system during water/rocks-soils interaction mechanism.

The isotopes of $^{226}$Ra and $^{224}$Ra are the decay product of uranium and thorium is present in variable amounts in solid aquifers. The resultant decay caused by the emission of alpha particles to generate radon. Radon is the naturally occurring radioactive noble gas. It is dissolved in water and is produced due to the decay of $^{226}$Ra by emission of alpha particle. It is highly mobile.

Radon is a carcinogenic gas and therefore it is hazardous to inhale since it emits alpha particles. Radon has the highest solubility in water of the noble gas, with a mole fraction value of 0.00125 at 37°C and a half life of 3.82 days, which is 15 times higher than that of helium or neon. Because of this property, radon can
accumulate in high concentration in ground water and poses a great health risk for people who ingest or inhale it. Radon in water may therefore present due dual pathways of exposure for individuals—through drinking water and inhalation of air containing radon released from groundwater. The aerosols tend to trap into the lungs where they release radiation and they break down further, these particles release small burst of energy. This can damage lung tissue and increases the chances of developing lung cancer over the courses of human’s lifetime. Radon can also reach other body tissues through ingestion resulting in radiation exposure to the internal organs. Ingestion of radon is believed to increase the risk of stomach cancer. Radon and its progeny are recognised as the most significant natural sources of human radiation exposure and the second leading causes of lung cancer. The radioactive contamination from the bore well water is high as compared to other sources like lake and river water. From the health, hygiene, and also radiological point of view, these types of studies are very essential for diagnosis and assessment of the dosage as cures in health risk and resulting from the consumption of radon water. The thesis comprises of five chapters, details of them is given below.

**Chapter 1** provides an introduction to the occurrence of radionuclides in ground water, ambient gamma radiation level, the concentration of radon, thoron and their progeny in indoor atmosphere, activity of radionuclides in soil, rock and building materials, radon and radium in ground water and also physiochemical parameters of ground water. Importance and scope of the present research work with objectives and study area also discussed in this chapter.

**Chapter 2** describes earlier works carried as literature reference. **Chapter 3** is devoted for instrument and methods of measurement used for present study. SSNTD is a cylindrical plastic cup divided into two compartments and having a provision for holding the SSNTD films in specific concentration. Measurement of $^{222}$Rn and $^{226}$Ra concentration in ground water was done by using Emanometery (bubbler) method. HPGe method was used to analyze the radionuclides in soil, rock and building materials also includes measurement of the physiochemical parameters such as conductance; pH and TDS were determined by using analytical kit to assess the overall quality of water.
Chapter 4 describes the results of the activity concentration of natural radionuclides in rocks, soil and building materials and also the annual average of gamma radiation levels in outdoor and indoor environment, activity concentration of radon, thoron and their progenies, seasonal variations of $^{222}$Rn, $^{220}$Rn and their progeny levels in different buildings in above mentioned districts. Radiological hazard indices calculated for the soil, rocks and building materials. $^{222}$Rn and $^{226}$Ra concentration in ground water and analysis of physiochemical parameters of water are too included in this chapter. Chapter 5 this chapter summarises the outcome of investigations, followed by references and list of research publications by the author.