Comparative Study on Alpha Track Detection from Phosphate Fertilizer Industrial Effluent Employing Polymeric Solid State Nuclear Track Detector

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***Abstract*--Phosphate ore maintain various amounts of naturally occurring radioactive materials (NORM) such as uranium, thorium, their decay products and potassium which can cause a potential health risk to the population. Therefore, mining and processing of phosphate ores for phosphate fertilizer production and thier processing redistributes these radionuclides among the various products, by-products and discharged wastes of the phosphate industries. Solid State Nuclear Track Detector such as Allyl diglycol polycarbonate (CR-39) detector has been employed in this study to measure alpha radioactivity from effluent samples.CR-39 was exposed to the samples over different exposure time for track registration. In present study innovative etching method employing 5% w/w Tetraethyl ammonium bromide (TEAB) with 6 M NaOH at 60˚C for 6 h was found highly effective than conventionality used 6 M NaOH & 6 M KOH for alpha track detection. Parameters such as track appearance time, track density and track diameter were analysed using optical microscope. It is clearly seen that employing TEAB, alpha tracks are appeared and formed faster in very short (1.5 h) time of etching in the CR-39. Track profile was observed under Spinning Disc Confocal Microscope, Scanning Electron Microscope & Atomic Force Microscope. Radionuclide contents of samples were also studied by ICP-MS.**

***Key words*:**SSNTD,CR-39, Alpha tracks, Effluents, TEAB.

I. INTRODUCTION

With the progress in the mechanical, innovative development and propelled applications a general awareness has alsoarise.There are a few non-atomic units which discharge alpha radiating normal radionuclides like ^{238}U and ^{232}Th into the earth, which has spread all over India and are consistently expanding **[1]**. Prominent sources are coal fired power stations, beach sand rich in rare earth minerals, rock phosphate and phosphoric acid used in production of superphosphates (phosphorus-based fertilizers), construction industry using granite and crude oil industry**[2]**. Fertilizers play an essential role in the farming sector to improve crop yields, so fertilizer production industries have spread awayacross the areas of the world. India is an agricultural country and large quantities of fertilizers are being used for the possible improvements and applications. Higher technologies have been applied for the development in agricultural methods and enhancement in the productivity. Fertilizers are made fundamentally out of nitrogen (N), phosphorus (P), and potassium (K), which are basic components for plants development**[3, 4].**To manufacture fertilizers, phosphate ore is used as a raw material which contains different measures of regular radioactive components. Due to chemical properties of some naturally occurring radionuclides and their extraction and processing from phosphate ore, practically they get incorporated into phosphogypsum and remains in instability condition when related to radioactivity levels contained in the raw materials. Most of the phosphogypsum is considered waste and is stored or discharged into the aquatic environment [**5]**.