

Effect of external radioactivity on the mineral grains from placer deposits of Bangladesh

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Major beach placers of Bangladesh, such as ilmenite, magnetite, rutile, zircon, garnet along with potential monazite concentrated and silica were undergone irradiation. Co-60 gamma irradiator was utilized to irradiate the separated minerals. Objective of this research was to observe any effect of gamma irradiation to the morphology and composition and thereby obtaining information of possibility of synthesizing any mineral. The mentioned heavy minerals have variety of industrial uses. Among them, ilmenite has the largest quantity in beach placer deposits of Bangladesh. However, the chemical grade of Bangladesh ilmenite has lagging behind the international grade, with TiO_2 content of approximately 35% and Fe of 55%. Therefore, potential utilization of these ilmenites for Ti are still not possible. Moreover, zircon and monazite contains radioactive materials needs to be studied in details for the presence of radioactive and rare earth element. Placer garnet and silica could be a potential industrial mineral if characterized properly. As nuclear geoscientific research activity, the present study reports the characterization of those minerals with the artificially induced radiation.

Individual minerals were separated from beach sand and upgraded to best possible physical grade by density, magnetic and electric separators. Gamma dose of 0.01, 0.1 million Grey (mGy) was provided by the Co-60 source of initial activity of 12 KiloCurie, KCi (with present source activity of 9.511 KCi) and with 100% source efficiency. The samples were again irradiated at 1.0 mGy with similar source of approximate present activity of 90 KCi (from initial source activity of 350 KCi). Microscopic observation, X-ray diffraction analysis and elemental composition was attempted before and after irradiation, and radiation induced effects was analyzed. The study would provide the characterization of those minerals for various application. Besides, it would also contribute to the study of the minerals' property in the case of any radiation effect of geological materials in any potential host rock of geological repository for radioactive waste.

Keywords: Gamma irradiator, Radioactivity, Placer Mineral, Bangladesh