

Executive summary of Minor Research Project

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Title of research project : **Characterization of Laterite Stones and Construction Materials Using Gamma Backscattering Technique**

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The ability of gamma rays to penetrate deep in to the material makes it attractive for use in nondestructive testing (NDT) applications. Gamma rays that leave the target material after scattering through the same surface where the primary radiation entered are called backscattered radiations. The gamma backscattering method is one of the better options among the nondestructive methods when accessibility to two sides of an object under investigation is not possible.

The experimental setup consists of scintillation detector assembly, source holding arm, and sample holder. Samples of Carbon, Aluminium, Iron, Copper, Concrete, and Fired clay bricks were used to study backscattering. A Microsoft Window-XP based spectroscopic application software winTMCA32 acts as user interface for the system setup and display.

The intensity of multiple scattered events increases with increase in target thickness and becomes almost constant beyond a particular value called saturation thickness for all the materials. The saturation thickness of concrete was estimated and found to be about 70 mm and the effective atomic number based on this was found to be 14.47. The location of reinforcement and variation in thickness of reinforcement in concrete can be detected easily employing this technique. The quality of bricks used in the construction of buildings can be validated using gamma backscattering technique. Water absorption and retention in fired clay bricks, which are mainly responsible for degradation of buildings, can be measured using this method. The density of laterite blocks found decreases with the depth within a quarry. Good quality laterite for building purpose is located in the top portion of the quarry.

The tomographic study clearly indicates the position of voids and iron rod intrusions in concrete slabs and fired clay bricks. The use of gamma backscattering technique for NDT is a powerful tool to enable visualization inside an object without physically opening or destroying it. This technique can be effectively used in characterizing the building materials based on their density, and to assess the integrity and suitability of the building or structure for continued use.
