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THERMOLUMINESCENCE STUDY OF CERAMIC TILE POWER

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Abstract

Many flooring materials most of them are in natural form are used to manufacture floor tiles for household flooring purpose. Many natural minerals are used as the raw materials required for the manufacturing ceramic ware. The following minerals are used to manufacturing the ceramic tiles i.e. Quartz, Potash, Snow white, Ivory soda, China clay, Ukraine clay, etc. Most of the minerals are from Indian mines of Gujarat and Rajasthan states, some of are imported from Russian sub continent. The present paper reports the thermoluminescence characteristic study of Ceramic Tile powder collected from the ceramic tiles manufacturing unit, Morbi. The as received minerals TL was recorded (NTL) and also 25Gy beta dose was given to each 5mg weighed sample and ATL was recorded. Annealed and quenched from 200, 400, 600, and 800°C followed by 25Gy beta dose given from Sr-90 beta source.

Keywords: Ceramics; X-ray diffraction; thermoluminescence, TGA, etc.

Introduction:

The present paper reports the thermoluminescence characteristics of the as received materials as well as annealed and quenched from 200, 400, 600, and 800°C followed by 25Gy beta dose given from Sr-90 beta source. The TL is recorded for the natural thermoluminescence (NTL) and followed 25Gy beta dose. The composite material is formed after heating the base materials plate at 1180°C for three hours which forms a glossy and glassy structure. The results are interesting. The TL peaks observed are around 149-369°C which are co-related to their natural counter parts /1-3/.

Experimental:

The ceramic Tile is collected from the industry. The composite material of Ceramic Tile Powder is selected to recorded thermoluminescence. In the present paper the TL set-up manufactured by Nucleonix Systems, Hyderabad was used /1/. Irradiation was carried using Sr-90 beta source. Every time 5mg of weighed irradiated samples were taken.

Results and Discussions:

Fig-1 is the TL of Ceramic Tile Powder as received (AR), annealed and quenched (AQ) from 200, 400, 600 and 800°C. The TL was recorded for 5mg weighed powder by giving 25 Gy beta dose from Sr-90 beta source. Curve-1 shows a well resolved peak around 157°C and followed by another well resolved peak at 336°C for AR sample. Curve-2 displays a well resolved peak at 157°C followed by hump and a small peak at 369°C for AQ 200°C sample. Curve-3 shows a broad peak around 149°C and a small hump for AQ 400°C sample. Curve-4 shows a well resolved peak at 148°C followed by a small hump for AQ 600°C sample. Curve-5 displays a small peak at 152°C followed by a broad peak around 284°C for AQ 800°C sample. From the figure it is also observed that as the annealing temperature increases from 200 to 800°C entire TL pattern changes and finally well resolved small peak followed by a broad peak is obtained. This may be due to various phase changes occurred while annealing the mineral from 200-800°C temperatures.

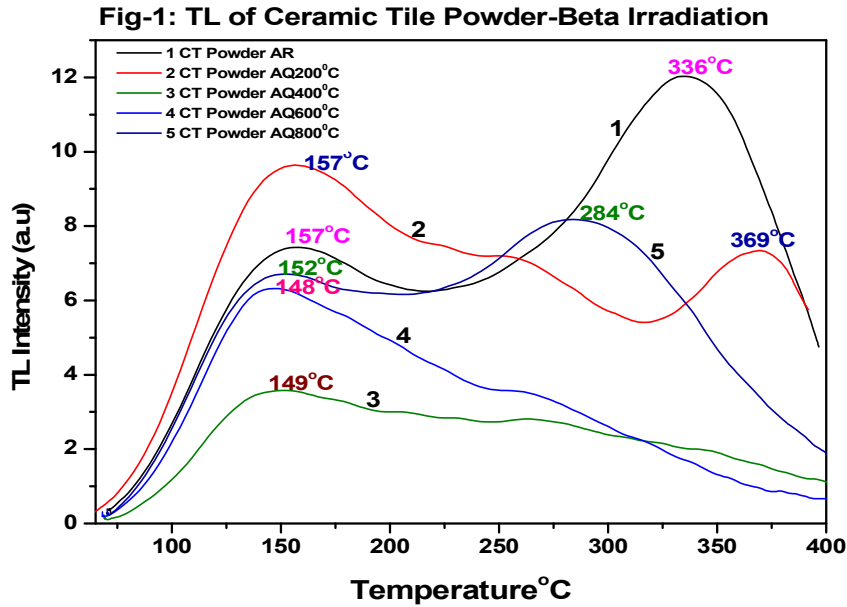


Fig-2 is the XRD pattern of Ceramic tile powder, it is clearly observed that the maximum peak obtained at 26.9° . The Crystallite size of Ceramic tile powder is calculated using Scherrer's formula and is found around **171 nm**.

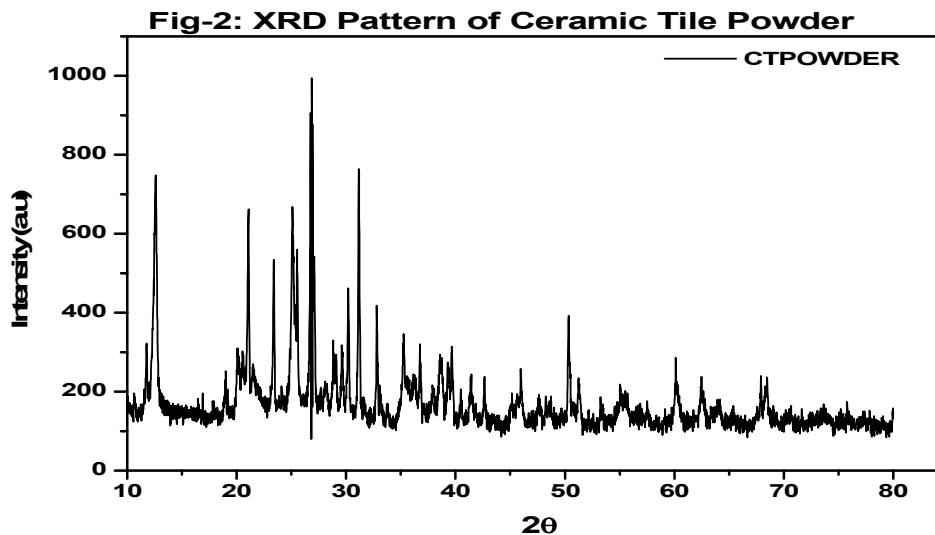
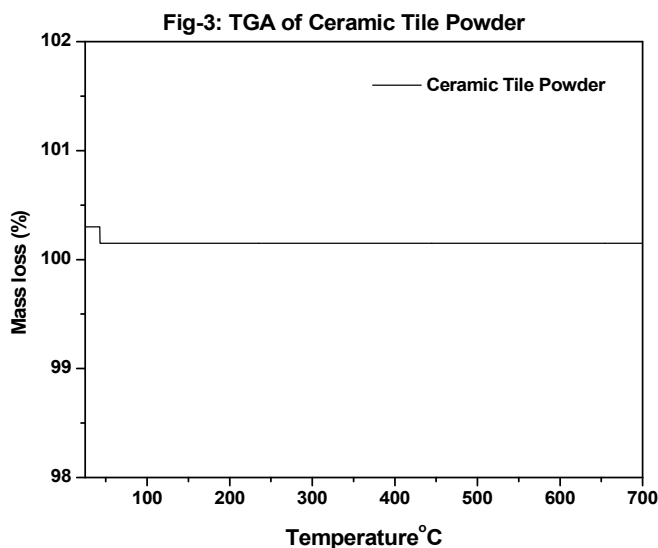


Fig-3 is the TGA of Ceramic tile powder. From figure it is found that there are many phase changes in the temperature range of 50°C - 700°C . Since the material is heated at 1200°C to get the Ceramic tile there is no phase change.



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Conclusion:

Good TL was observed for ceramic material with two isolated peaks. The formation of ceramic is confirmed by XRD as well as TGA.

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