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Potential of microwave processed cordierite based glass-ceramic glazes for next generation floor tiles

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Abstract

Glass-ceramic materials have a good prospect for preparing ceramic tile coatings because of its high softening point, high chemical and abrasion resistance and good coating capability for clay support. Thus, glass-ceramics have become attractive alternative as tile glazes as compared to traditional amorphous glazes. Feasibility studies on glass-ceramic glazes containing different crystalline phases have been already reported. Tile glazes with improved mechanical properties can be achieved by using cordierite based glass-ceramic glazes. Cordierite glass-ceramics can be developed by crystallization of a glass in the $CaO–MgO–Al_2O_3–SiO_2$ quaternary system through controlled heat treatments. In the present investigation, cordierite based glass-ceramic glazes were formed on conventional ceramic floor tiles by microwave processing method and compared with the glass-ceramic tile glazes produced by conventional processing under identical conditions. X-ray diffraction showed that the crystalline phases were present in greater amount in the residual glassy phase in the case of microwave processed glass-ceramic glaze than that in the conventionally processed glaze. Field emission scanning electron microscopy showed the presence of fine crystallites in the microwave processed glaze surface while the conventionally processed glaze surface had quite large crystallites. It has been observed that microwave processed glass-ceramic glaze surface was smoother than that of the conventionally treated glaze. Further, Vickers hardness measurements showed much improved hardness values of microwave processed glaze surfaces as compared to those in the conventionally processed ones. The current study showed the possibility to obtain new floor tile glass-ceramic glazes with improved mechanical and optical properties using microwave processing.

Biography

Dr. (Mrs.) Sumana Ghosh has passed B.E. (Metallurgical Engineering) from Bengal Engineering College and Science University, Shibpur, India. She has passed M.Tech. (Materials Science) from Indian Institute of Technology, Kharagpur, India. She has completed her Ph.D. at the age of 32 years from Jadavpur University, Kolkata, India. She is a senior scientist of CSIR-Central Glass and Ceramic Research Institute, Kolkata, India. She has published 22 papers in SCI journals and 15 papers in Conference Proceedings. She has 5 Indian Patents. She is a reviewer of some SCI journals.