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ABSTRACT BOOK

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Geosciences and the Challenges of the 21st Century



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S23.

Geomaterials for a sustainable economy: advancements in the state-of-the-art, innovative characterization, and cutting-edge applications

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Industrial ceramic manufacturing: minero-petrographic characterisation of commercial tiles and experimental ceramic samples for the determination of quality indicators

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This research focuses on the characterization of commercial ceramic tiles and experimental ceramic samples from a minero-petrographic and technological point of view to identify performance parameters and defects. Samples of industrial tiles and various raw materials were supplied by Gruppo Ceramiche Gresmalt S.p.A., a leading company in the ceramic sector. This company is also leading a project called START (<https://www.start-innovability.it/>), Sustainable Data-driven Manufacturing, funded by the Ministry of Enterprises and Made in Italy, aimed at researching and validating technological solutions for digital transformation and product optimization. The study analyzed the samples to support the project's objective of developing predictive and classification models for the quality of ceramic materials using machine learning and feature extraction techniques. Various analytical methods have been used, including optical microscopy, X-Ray diffractometry, scanning electron microscopy and electron microprobe analysis, to characterize the tiles from mineralogical, petrographic and chemical perspectives. Water absorption and linear shrinkage (after firing) tests were also carried out to evaluate their performance characteristics. The results indicate that commercial tiles mainly have some structural differences, despite controlled production processes. Analytical techniques have revealed microdomains and microstructures within the tiles that can cause defects. The experimental ceramic samples showed slight differences due to variations in the composition of the used raw materials and in the production conditions (mainly firing temperature). Water absorption tests have highlighted the importance of process parameters to ensure the compactness and strength of the product. In summary, the research provides preliminary insights into the technological aspects of ceramic production, linking them to defects and performance, which can improve the optimization of production processes.