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Editorial: 2022 Retrospective: structural materials

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Editorial on the Research Topic
2022 Retrospective: structural materials

Welcome to the Research Topic "*2022 Retrospective: Structural Materials.*" This curated Research Topic highlights esteemed spontaneous articles from the past few years, personally selected by our Chief Editor, Prof. John L. Provis. The work showcased here underscores the extensive spectrum of research conducted within the section and seeks to illuminate its primary areas of interest. All the studies presented here demonstrate significant advancements in theory, experimentation, and methodology, offering solutions to compelling problems. Therefore, the editorial team deems it crucial to give special attention to these matters.

Three of the four articles in the present issue of Frontiers in Materials address different aspects of cement concrete, and the remaining articles focus on utilizing 3D digital image processing to identify voids and detect pavement distress associated with road conditions.

The first paper by Noman et al. addressed low-cost repair techniques for restoring the mechanical properties of fire-damaged concrete. In their study, the concrete samples underwent heating within the range of 400°C to 800°C using a propane gas furnace. The tests included ultrasonic pulse velocity, rebound hammer, and compressive strength measurements. The findings showed that a cement-based slurry injection (with a water curing repair technique) is the best low-cost repair technique for restoring residual strength and stiffness for concrete damaged by a fire that reached 700°C.

In recent years, the three-dimensional ground-penetrating radar system has been an effective method of detecting road void disease. In line with the aim of this Research Topic, Huang et al. highlighted the research on a three-dimensional ground-penetrating radar void signal recognition algorithm based on a digital image. The images were processed by binarization, corrosion, expansion, connected area inspection, fine length index inspection, and three-dimensional matching inspection. The authors concluded that the void identification algorithm can accurately identify the position of the void area between 2.2% and 17.3%. They also indicated that the volume index calculated by the algorithm has a specific engineering application value compared to other methods.

Slag gypsum is beneficial to industrial backfill, making its use in mine backfill a good application prospect. Xiaobing et al. presented their study on the effect of slag-gypsum binder as a substitute cement on the stability of backfill mining. In the

investigation, slag-gypsum binder (SGB) was used as a cement replacement in the mine backfill. Workability, X-ray diffractometry, and scanning electron microscopy were employed in their study. The authors found that the SGB can effectively improve the strength of backfill and has a positive effect on early strength. They also noted that SGB and cement have very different hydration behaviors.

The synergistic effect of combining supplementary cementitious materials as partial substitutes for clinker improves cement properties and reduces its clinker factor and, hence, its carbon footprint. Our final paper highlights the environmental and mechanical assessment of blended cement containing a high mineral admixture content. Rodrigues et al. concluded that the formulated cements, particularly those in multi-addition cements, are potential alternatives for reducing greenhouse gas emissions while preserving the mechanical performance demanded by construction market practices.

Overall, we hope that the comprehensive research showcased in this Research Topic enhances the understanding and interest of all researchers and practitioners dedicated to recent developments and advancements in structural materials and analysis.

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Conflict of interest

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