

## PHOTO-THERMO-ELECTRICAL PROPERTIES OF CEMENT-BASED MATERIALS. A COMPUTATIONAL PERSPECTIVE

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**Abstract.** Concrete and cement-based materials are among the most widely used substances on earth, second only to water. These versatile materials have shaped the modern world, forming the backbone of everything from skyscrapers to highways and bridges. While traditionally valued for their structural properties, recent advancements have revealed their potential in energy conversion and storage. In recent years, innovative construction methods have emerged, leveraging cementitious composites for energy solutions. These include rechargeable concrete batteries, cementitious thermal energy storage devices for concentrated solar power plants, and radiative cooling concretes. Such breakthroughs have the potential to transform how we approach energy storage and efficiency in the built environment. In this talk, we will analyze how computational physics can guide this challenge. In particular, special attention will be paid to correlate the cementitious microstructure with the final thermal and photonic properties.