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2023 RESEARCH PROJECT STATEMENT

Research Topic:

Recycled Ground-Glass Pozzolan (RGGP) for Use in Cement Concrete

Research Budget and Timeline:

- \$250,000
- 18 months (of which final 3 months are for review)

Problem Statement and Objectives

Cement concrete is the most critical building material used in the construction of our infrastructure. However, hydraulic cement, the key ingredient of cement concrete, produces an immense amount of heat and carbon dioxide during the manufacturing process. The manufacture of hydraulic cement, the key ingredient for cement concrete, accounts for 7% of human-made carbon dioxide emissions according to the International Energy Agency (IEA). Additionally, other hydraulic cement replacement materials used in today's cement concrete, such as fly ash and slag, are the byproducts of coal-fired power stations and steel manufacturing, which also increases our carbon footprint. These materials are becoming more and more scarce, resulting in a problematic supply crunch and increases in cost. It is clear that we must find environmentally conscious alternatives to the way we produce concrete.

Recycled ground-glass pozzolan (RGGP) is a potential hydraulic cement replacement material, manufactured from recycled glass products, with the potential to greatly reduce the amount of hydraulic cement (up to 50% reduction) in cement concrete. The objective of this research project is to validate the efficacy of RGGP, to decrease our carbon footprint and increase the quality and long-term durability of cement concrete used in MassDOT projects.

Anticipated Outcomes and Deliverables:

Outcomes: This research project will evaluate the viability of RGGP as a suitable replacement of hydraulic cement and alternative to traditional supplementary cementitious materials (SCM). The anticipated deliverables are as follows:

Deliverables:

1. RGGP Cement Concrete Mix Design Formulations
2. RGGP Specification for MassDOT Implementation
3. Final presentation
4. Final report summarizing research activities, results, and recommendations