

## **Analyzing the Effect of Ground Glass Pozzolan as a Supplementary Low-Carbon Cementitious Material in Concrete**

<sup>1</sup>Bismark Yeboah, <sup>2</sup>Anna Casavant, Advisors: <sup>2</sup>Dryver Huston, <sup>1</sup>Mandar Dewoolkar, <sup>1</sup>Civil and Environmental Engineering, <sup>2</sup> Mechanical Engineering, University of Vermont

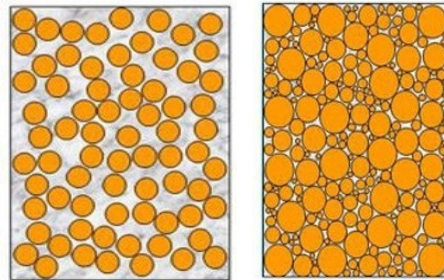
### **Abstract**

Concrete is the most widely used construction material in the world. To achieve high-performance concrete in terms of strength and durability, a high binder content is often used, which mostly consists of cement. However, about 5-7% of the world’s total CO2 emissions are considered to be associated with cement production. Also, high binder content results in higher costs, cracking, and shrinkage damage. Reducing cement content in concrete, therefore, has sustainability benefits. This research seeks to develop concrete mix designs that meet modern high-performance durability standards while supplementing cement with ground glass pozzolan, a more environmentally friendly concrete material. The research will also explore mix designs with locally sourced materials while investigating the effect of packing density in optimizing binder and aggregate compositions. We hope this research helps to reduce the billion tonnes of CO2 emitted annually into our environment and help our environment to be more sustainable.



<https://pozzotive.com/product-benefits/>

Fig 1: Ground Glass Pozzolan as Supplementary Cementitious Materials



<https://myrenovationspecialist.com/concrete-failure/>

Fig 2: Poorly packed aggregates(left) and well Packed aggregate with maximum packing density(right)

**Acknowledgements:** Funding for this research is provided by the Transportation Infrastructure Durability Center at the University of Maine under grant 69A3551847101 from the U.S. Department of Transportation’s University Transportation Centers Program. [The Barrett Foundation. James Wild and Nick van den Berg of VTrans provided technical advice]

### **References**

[1] Kamal H. Khayat, PhD, Iman Mehdipour, “Economical and Crack-Free High-Performance Concrete for Pavement and Transportation Infrastructure Construction”, 2016.