WHY DOES THIS RESEARCH MATTER ON EARTH TOO?
Concrete is the most widely used man-made material in the world, second only to water. The large -scale production of cements contributes to ~5% anthropogenic CO2 emission. Microgravity research can lead to more durable and hence more cost-effective material.

RESEARCH OBJECTIVES
The intent of this work is to utilize the microgravity environment aboard the International Space Station (ISS) to investigate the complex process of cement solidification.

BACKGROUND ON CEMENT HYDRATION
Microstructural development of hydrating cement results in elaborate combinations of amorphous and crystalline phases. The morphology, volume fraction, and distribution of these phases ultimately determine the hardened cement’s material properties.

HYPOTHESIS
Minimizing gravity-driven phenomena, such as thermosolutal convective flow and sedimentation, will ensure crystal growth strictly by diffusion and a considerably different microstructure than that observed in typical laboratory conditions on Earth.

RESEARCH DELIVERABLES:
• Determine the mechanical properties of hardened samples mixed in 0g;
• Petrographic and microstructural investigation
• Computer simulation of cement hydration, including the role of gravity.

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Research Opportunities in Materials Science – Materials Lab Open Science Campaigns for Experiments on the International Space Station; Under Science and Technology and other Research and Development (ST)

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