

**Transportation Infrastructure Precast Innovation Center**

**(TRANS-IPIC)**

**University Transportation Center (UTC)**

*Exploring Fungal-Induced Carbonate Precipitation (FICP) for Healing Concrete Cracks*

*LS-23-RP-03*

Quarterly Progress Report

For the performance period ending *03/31/2024*

**Submitted by:**

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**Collaborators / Partners:**

*None*

**Submitted to:**

TRANS-IPIC UTC

University of Illinois Urbana-Champaign

Urbana, IL

**TRANS-IPIC Quarterly Progress Report:**

**Project Description:**

1. Research Plan - Statement of Problem

*Concrete structures can develop cracks during early-stage curing and long-term aging processes, reducing load-bearing capacity and affecting the service life of concrete structures. This research aims to explore fungal-induced carbonate precipitation (FICP) to heal cracks and improve the durability of concrete. FICP is a natural biomineralization process involving calcifying fungi's metabolic activities to induce CaCO3 precipitation. This research investigates the performance of several fungal strains (e.g., their growth behavior and efficiencies of FICP versus time) on the surface of cement mortar. The optimal fungal strain will be used to assess its healing capability on concrete cracks.*

1. Research Plan - Summary of Project Activities (Tasks)

*Two research objectives are proposed to advance FICP for healing concrete cracks.*

*Objective I: Investigating the performance of several fungal strains (e.g., their growth behavior and efficiencies of FICP versus time) on the surface of cement mortar. The Objective I will help to find the optimal fungal strain that can grow quickly and induce the largest amount of CaCO3 precipitation on the cement mortar surface. The optimal fungal strain will be used in Objective II to heal concrete cracks.*

*Objective II: Assessing the healing capability of the optimal fungal strain on the concrete cracks. This objective will evaluate the feasibility of fungi for healing concrete cracks, which will be compared to the capability of bacterial induced carbonate precipitation.*

*Task 1. Comparing the performances of three fungal strains on CaCO3 precipitation.*

*Task 2. Investigating the performance of three fungal strains to induce CaCO3 precipitation on the mortar surface.*

*Task 3. Healing artificial concrete cracks using the optimized fungal strain.*

**Project Progress:**

1. Progress for each research task

*Task 1 progress [60% completed]. The research team is working on Task 1 to compare the performances of three fungal strains on CaCO3 precipitation.*

*Task 2 progress [0% completed]*

*Task3 progress [0% completed]*

1. Percent of research project completed

*[Estimate 30% of total project completed through the end of this quarter]*

1. Expected progress for next quarter

*Finish Task 1 and 50% of Task 2*

1. Educational outreach and workforce development

*Research demonstration for ~100 local middle school students through LSU ENGage outreach program, organized by LSU Chevron Center for Engineering Education.*

1. Technology Transfer

*None*

**Research Contribution:**

1. Number of papers

*None*

1. Number presentations (when, where)

*None*

**References:**

 *None*