

Cellulose Excelsior Cement Composite as Green Alternative for Concrete and Dimensional Lumber

C3, a cellulose cement composite, will be developed for use in residential and light commercial construction as an alternative to dimensional lumber, sheet products (e.g., plywood/drywall), and concrete. C3 consists of cellulose excelsior (CE)/cellulose nanomaterial (CNM), and cement as a binder.

The research work with Dr. Youngblood in the fabrication of C3 will involve surface modifying the cellulose excelsior and cellulose nanomaterials and fabricating the composite of cement with cellulose excelsior (wood wool) and cellulose nanomaterials. Cellulose excelsior or wood wool is a long-sheared fiber of wood generally used as a packaging material and as a sound-deafening material for acoustic purposes. They have been used to fabricate wood-cement composite since the 1900s but the composites have not found applications as structural materials as the adhesion between wood and cement is not strong. The surface modifications of cellulose excelsior and cellulose nanomaterials like silica and alumina grafting are expected to improve the adhesion between organic wood wool and inorganic cement. Moreover, the composite will have 70-90 wt% of wood wool and the rest amount as cement and cellulose nanomaterials. The composite has a huge potential to reduce the carbon footprint in the construction industry as the production process of cement is carbon intensive. With wood replacing up to 90 wt% of cement in the composite, the carbon footprint is expected to be quite lower than conventional concrete.

The undergraduate research student is expected to set their working hours and communicate the same to Dr. Youngblood and graduate student Akshat Verma. The requirement for the undergraduate student is in Spring 2025. The student is expected to work along with graduate student Akshat Verma. This research opportunity will encompass growth in networking, critical thinking, and high-end research skills. Interested students should reach out to the graduate student directly via email keeping Dr. Youngblood in the loop.

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