Additive Manufacturing with Wood-Based Composites for Building Construction Applications

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Housing in the United States is unaffordable for over half of the population. Additionally, buildings emit more than one-third of greenhouse gases globally, with most generated by material manufacturing and transportation. This presentation will describe the state of construction 3D printing and our team's experience developing a renewable and recyclable thermosetting wood-based composite system for 3D printing of structural walls in housing and light-commercial buildings with the goal of reducing carbon emissions and cost. This novel composite utilizes minimally processed wood fibers with an inorganic binder and is cured in a variety of modes, including at room-temperature. When the binder cures, it sequesters carbon dioxide, thereby reducing atmospheric carbon dioxide. The rheological properties of the material are acceptable for extrusion and when cured, produce a material with strength and stiffness on par with concrete used in these applications. Printing process considerations will also be discussed along with the short-term outlook for this research.