

MWP – Young Researcher Abstract 2024

Project title: Graphene Incorporated Bioadhesive: The Future of Wood Composite Manufacturin	
Author: Papiya Bhowmik*, Reza Hosseinpourpia	
Affiliation:	E-mail:
Postdoc*, Department of Forestry and Wood Technology,	Papiya.bhowmik@lnu.se
Linnaeus University, Hus M, Växjö, Sweden, 35254	
Abstract (approx. 200 words):	
Wood composite panel manufacturing predominantly relies on carcinogenic formaldehyde-derived adhesive, which emits harmful VOCs. Bioadhesives are becoming prominent substitutes to replace these emissions. However, improving their properties to meet modern demands remains challenging due to long pressing times, weak bonding, and high curing temperatures. Graphene, a two-dimensional allotrope of carbon, has extraordinary mechanical, electrical, and thermal properties. Graphene can significantly improve the thermomechanical and barrier properties of wood, broadening its application range in structural and loadbearing applications. Graphene-based nanomaterials in adhesives show enhanced bonding characteristics due to their high surface energy and compatibility with lignocellulosic surfaces. Hydrogen bonds between oxygencontaining functional groups on graphene oxide (GO) and hydroxyl groups in cellulose strengthen the interface and improve the properties of the adhesive. This work introduces a novel method of incorporating green graphene (derived from lignin) with a side stream derived from the sugar conversion process to develop an adhesive formula with reduced curing time and temperature and enhanced mechanical properties. This sustainable approach expects to provide competitive advantages for the Swedish wood product sector by moving towards bio-based adhesives thus reducing the industry's carbon footprint.	
Key words: Boiadhesive, graphene, lignocellulose, wood composite, particle board.	