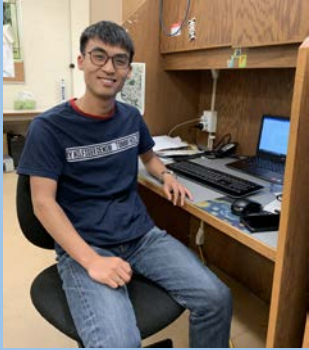Zizhen Gao,
Shandong, China

Fracture of a Bond-line of Adhesively Laminated Solid Wood Products

My project aims to quantitatively evaluate the fracture properties of the bond-line in adhesively laminated solid wood products. To reach this, a new algorithm will be developed to simulate the fracture behavior of an adhesive bond-line.

In this study, black spruce will be used since it is the most common species used in wood buildings across Canada. The adhesives will be phenol resorcinol formaldehyde (PRF), polyurethanes (PUR) and emulsion polymer isocyanates (EPI), which are the most commonly used in manufacturing of engineering wood products.

A special tensile test method named the *Arcan* test (Figure 1) will be used to obtain the fracture properties of a bond-line with different fracture modes (Mode I, Mode II and Mixed-mode). The Digital Image Correlation systems (DIC) with two cameras with high-speed lens will be used to obtain the stain distribution on the surface of a specimen. The microscopic DIC will be used to obtaining the strain distribution along a bond-line and around a crack tip.

A model of simulating the fracture performance and crack propagation of a bond-line will be developed based on the Theory of Peridynamics, the application of which has not been reported in the research of wood.

The outcomes to be obtained from my study will contribute to the knowledge of fracture properties of adhesively laminated solid wood products and the elastic properties of major structural adhesives. Up to now, the modified *Arcan* test fixture has been designed and made, Figure 1. The preliminary experimental work verified that it was feasible to use the DIC technique to identify the bond-line (Figure 2) and measure the strain distribution near a crack tip (Figure 3). I am ready to present my proposal and believe that I can complete my thesis project by December 2022.
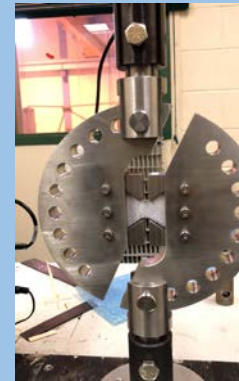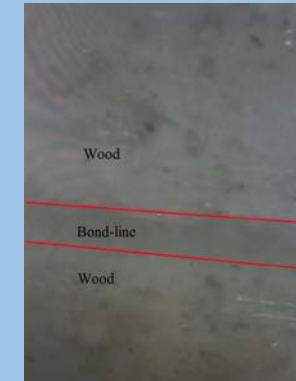

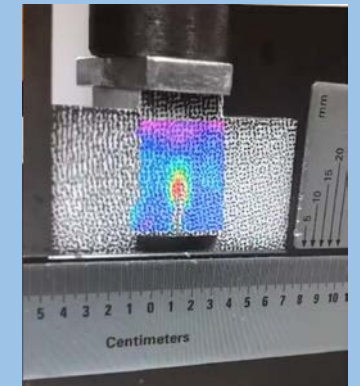Fig.1 The *Arcan* test fixture

Fig.2 A bond-line in a DIC image

Fig.3 Strain distribution near a crack tip