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► To cite this version:

Rosmi Biyo'O, Achille Bernard Biwole, Rostand Moutou Pitti, Julien Charly Nyobe, Emmanuel Yamb. Crack Propagation on some Central African Tropical Woods: Experimental Approach and Numerical Simulation. SWST 67th International Convention " Society of wood science and technology ", Jun 2024, Portorož, Slovenia. <hal-04853869>

HAL Id: hal-04853869

<https://hal.science/hal-04853869v1>

Submitted on 22 Dec 2024

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Crack Propagation on some Central African Tropical Woods: Experimental Approach and Numerical Simulation

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ABSTRACT

The use of wood for structural purposes in mechanical engineering, in the form of solid wood, presupposes a good knowledge of the properties of the elementary wood components used. Without this, woods remain excluded from the modern world of mechanical design. In Cameroon, Bilinga (*Diderrichii nauclea*), Dabema (*Piptadeniasmetrum africanum*) and Padouk (*Pterocarpus soyauxii Taub*) are the main forest resources used in construction. Adding value to these resources is a major challenge for the timber industry. The aim of this study is to investigate the fracture behavior of this resource both experimentally and numerically. This study focuses on the process of different primer lengths, different species, different basal density rates for tissue loading direction (longitudinal-tangential) and different loading modes and three-dimensional effects are also taken into account. In this case, the mixed-mode crack growth specimen is considered in order to investigate the effect of scale and its impact on wood fracture. The impact of moisture variation on the cracking parameters, like stress intensity factor or energy release rate, of this type of wood is shown. This knowledge will represent an important step towards the optimal use of these species for structural applications. Indeed, the design of such structures requires detailed knowledge of the mechanical behavior of the constituent material, particularly with regard to cracking. The results show that Dabema and Bilinga have more ductile behavior, i.e., the rate of energy restitution is much higher than Padouk's. However, Padouk and Bilinga have a higher stress intensity factor than Dabema for this reason, Dabema and Bilinga are more resistant to crack propagation than Padouk.

Key Words : Crack Propagation, Tropical Woods, Experimental Approach, Numerical Simulation.

Acknowledgment:

The authors would like to thank the “Agence Nationale de la Recherche” via the ANR PRCE DIAM-WOOD project for supporting their mobility in order to attend this conference devoted to wood science and technology.