

# Study of the Influence of the Charge and the Size of the Abrasive Grains on the Wear Resistance of Wood Particles: Application to *Thieghemella Heckelii*, *Khaya Anthotheca* and *Pericopsis Elata*



Ngouffo Koukounang René, Takoudjou Talla Aubin, Azeufack Tonfack Ulrich Gael, Claude Takoumbe, Mabekou Takam Jeanne Sandrine, Talla Pierre Kisito

**Abstract:** In this paper, the effects of normal loading and abrasive grain size on the friction and wear behaviour of two-body abrasive wear for the species *Thieghemella heckelii*, *Khaya anthotheca* and *Pericopsis elata*, commonly known as makore, mahogany and assamela, respectively, were investigated. The abrasion tests were conducted at a rotational speed of 40 rpm for a period of 250 s, with load levels of 250 g, 500 g, and 750 g, using abrasive wheels with grain sizes of P600, P120, P80, and P60 in dry friction conditions. Before the wear tests, a study of the physico-mechanical properties was carried out. It was found that makore is less dense and more elastic than mahogany and assamela. Furthermore, the abrasion results showed that the worn volume increases linearly with time as the pull-out strength of the wood particles increases with their elasticity. The irregularity observed in the three-body abrasion of some wood species above a particular value of abrasive grain size was observed in the abrasion of four species at all three load levels. Indeed, the abrasion technique used reveals the abrasion resistance at all angles of attack. However, the effect of the size of the abrasive grains is not observed on the variation of the friction coefficient. Furthermore, the evolution of the friction coefficient with time observed in a contact between a smooth and a rough surface was also observed when the operating conditions became stable in the contact. At high loads, the wear coefficient decreases and reaches a critical value from which the evolution is constant for the smaller grain diameters (P600) as long as the decrease is moderate for the remaining abrasive grains. Similarly, as the load increases, the friction coefficient decreases to a moderate value.

**Keywords:** Abrasive Grain Size Wear Coefficient, Abrasive Wear, Friction, *Khaya Anthotheca*, *Pericopsis Elata*, *Thieghemella Heckelii*.

**Abbreviations:**

RTL: Radial, Tangential, and Longitudinal

## I. INTRODUCTION

Wood is a natural material that comes from a highly complex living organism. For more than 100,000 years, humans have learned to control fire by rubbing a piece of hardwood inside a piece of softwood. However, humans have always sought to reduce friction and avoid wear to minimise effort [1]. The process of abrasive wear, which involves mechanically tearing particles from a material using abrasive paper, has been applied to metal, plastic, and composite materials [2]. Wood is a natural material derived from a highly complex living organism. Nowadays, these wear methods are also applied to wood and are fundamental for determining wear resistance [3]. Additionally, several tribological studies have been conducted on various wood materials. For example, [4] compares the abrasive wear properties of aluminium and katsura wood and concludes from their research that the two-body abrasive wear of katsura wood is phenomenologically comparable to that of aluminium when the elastic limit of the material is adopted as the wear variable [5]. studied the effects of annual rings on the abrasive properties of wood and reported that fewer than three yearly rings on the rubbing surface can produce an irregular property [6]. reported that in two-body abrasive wear, wood becomes more challenging to abrade as the yield strength and density of wood increase, and the microstructure of the wood surface also affects abrasive wear [7]. report that an increase in the mechanical properties of wood, e.g., compressive strength or macro-hardness, also leads to an improvement in its abrasion resistance. The majority of the previously mentioned work has focused on the parameters that influence material wear, and it appears that parameters such as load, microstructure, hardness, and abrasive grain size significantly impact the wear resistance of materials. In this work, we consider three wood species: Makore, Mahogany, and Assamela. These species are used in work where friction and wear are significant problems, especially for wooden floor coverings. Therefore, it becomes essential not only to look at the parameters that influence or accelerate wear,



Manuscript received on 01 July 2025 | First Revised Manuscript received on 13 July 2025 | Second Revised Manuscript received on 16 August 2025 | Manuscript Accepted on 15 September 2025 | Manuscript published on 30 September 2025.

\*Correspondence Author(s)

**Ngouffo Koukounang René\***, Department of Mechanical Engineering, University of Buea, Kumba, Cameroon, Mechanics and Adapted Materials Laboratory (LAMMA) Douala Cameroon. Email ID: [ngouffo2002@yahoo.fr](mailto:ngouffo2002@yahoo.fr), [renengouffo2@gmail.com](mailto:renengouffo2@gmail.com), ORCID ID: 0000-0001-9123-5152

**Takoudjou Talla Aubin**, Department of Physical, University of Dschang, Dschang, Cameroon. Email ID: [takoudjouaubin@gmail.com](mailto:takoudjouaubin@gmail.com), ORCID ID: 0000-0003-3539-9800

**Azeufack Tonfack Ulrich Gael**, Department of Mechanics and Industrial Engineering, University of Buea, Buea, Cameroon. Email ID: [azeufack.ulrich@ubuea.cm](mailto:azeufack.ulrich@ubuea.cm)

**Claude Takoumbe**, Mechanics and Adapted Materials Laboratory (LAMMA) Douala Cameroon. Email ID: [takoumceleste@yahoo.fr](mailto:takoumceleste@yahoo.fr), ORCID ID: 0000-0003-3968-7551

**Mabekou Takam Jeanne Sandrine**, Department of Physical, University of Dschang, Dschang, Cameroon, [sandrinengamga@yahoo.com](mailto:sandrinengamga@yahoo.com), ORCID ID: 0000-0001-8395-8123

**Talla Pierre Kisito**, Department of Physical, University of Dschang, Dschang, Cameroon. Email ID: [tpierrekisito@yahoo.com](mailto:tpierrekisito@yahoo.com), ORCID ID: 0000-0003-2987-9322

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

# Study of the Influence of the Charge and the Size of the Abrasive Grains on the Wear Resistance of Wood Particles: Application to Thieghemella Heckelii, Khaya Anthotheca and Pericopsis Elata

but also to analyse the influence of these parameters on the friction behaviour. In this study, the rubbed surface is perpendicular to the direction of the wood fibres. The objective of the present study is to evaluate the effect of load and abrasive grain size on the friction and wear behaviour of dry contact between wood and abrasive wheels.

## II. MATERIALS AND METHODS

A physico-mechanical characterisation study of makoré, mahogany, and assamala wood species was carried out on healthy, defect-free, standardised specimens of small dimensions from diametral plates obtained using plot sawing. The geometric characteristics of the specimens for this characterisation study are described in Figure 1. Before testing, each specimen was conditioned for two months in the Laboratory of Mechanics and Modelling of Physical Systems (L2MPS) at the University of Dschang, where the temperature and relative humidity were regulated at  $24\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and  $65\% \pm 5\%$ , respectively. Throughout our experiments, the specimens were weighed using a My Weigh brand balance with a precision of 0.01 g (Fig. 3b).



[Fig.1: Geometric Characteristics of Physical and Mechanical Characterisation Specimens]

### A. Density

Specimens of size  $20*20*20\text{mm}^3$  in the respective natural orientations (RTL) (Fig. 1a) were made according to the current standard (NF B51-004), and the standard (NF B51-005) was used for the determination of moisture content. The volume of each specimen is determined by its buoyancy.

### B. Modulus of Rupture in Static Bending

The modulus of rupture was determined using a branded hydraulic press (Fig. 2c), which had a maximum load cell of 100 bar. The specimens have dimensions of  $20 \times 20 \times 360\text{ mm}^3$  in the Radial, Tangential, and Longitudinal (RTL) directions, respectively. Four-point bending tests were performed, and the modulus of rupture was obtained according to NF B 51-008 as follows:

$$\sigma = \frac{3P(l-a)}{2bh^2} \quad (1)$$

Where P is the maximum load, l is the distance between the two support points, a is the distance between the two load points, b is the width, and h is the height of the specimen.

### C. Longitudinal Modulus of Elasticity

To measure the modulus of elasticity of our species, we have chosen to use a non-destructive method. The method used is called the HOOKE method. This method is used at CIRAD (Agriculture Research Centre for International Development) for characterising the modulus of elasticity of wood. On beams of dimensions  $20*20*360\text{ mm}^3$  (RTL)

without defects, two extensometer gauges are glued to the half of the Wheatstone bridge (Fig. 1c). The beam, placed on the test bench as shown in Figure 2a, is tested in static bending at four points according to the standard NF B 51-016. The strain at the centre of the specimen is recorded using the extensometer bridge (Fig. 2b). Table I presents the physical and mechanical properties of the species.



[Fig.2: Four-Point Static Bending Apparatus]

Table I: Physical and Mechanical Properties of Species

Species	MOR in Static Bending (MPa)		MOE in Static Bending (MPa)		Density $\text{kg/m}^3$	
	Value	Humidity	Value	Humidity	Value	Humidity
Makore	$46 \pm 4$	14	$9711 \pm 3461$	14	$654 \pm 30$	14
Assamela	$67 \pm 7$	14	$9647 \pm 1849$	14	$669 \pm 67$	14
Mahogany	$46 \pm 4$	14	$7911 \pm 493$	14	$711 \pm 26$	14

### D. Wear Test

In this section, the specimens used have a geometric dimension of 112 mm in diameter and 7 mm in thickness (Fig. 3a) and were subjected to an abrasion test using a Taber abrasimeter model DH-TA-01. The wooden specimen was placed on the positioning plate after weighing with a precision balance (Fig. 3b). Then, the specimen was pressed from above by two abrasive wheels with a diameter of 45 mm and a distance of 63.5 mm. Once contact is made at  $t = 0$ , the positioning plate and specimen assembly rotate at a speed of 40 rpm, causing abrasive wear. The dynamic friction coefficient and wear rate in stationary sliding are then measured at successive time intervals ranging from 10 to 250 seconds. Between each measurement, the drive system is stopped, the mass is reweighed, and the contact surface is cleaned with a brush. Figure 3c shows the test process in detail. The torn-off particles are vacuumed off by the vacuum cleaner nozzle so that they do not contribute to the movement. The abrasive grains of the grinding wheels in the experiment were P60, P80, P120, and P400 alumina. The masses used to apply the load to the friction surface are 250 g, 500 g, and 750 g, respectively.



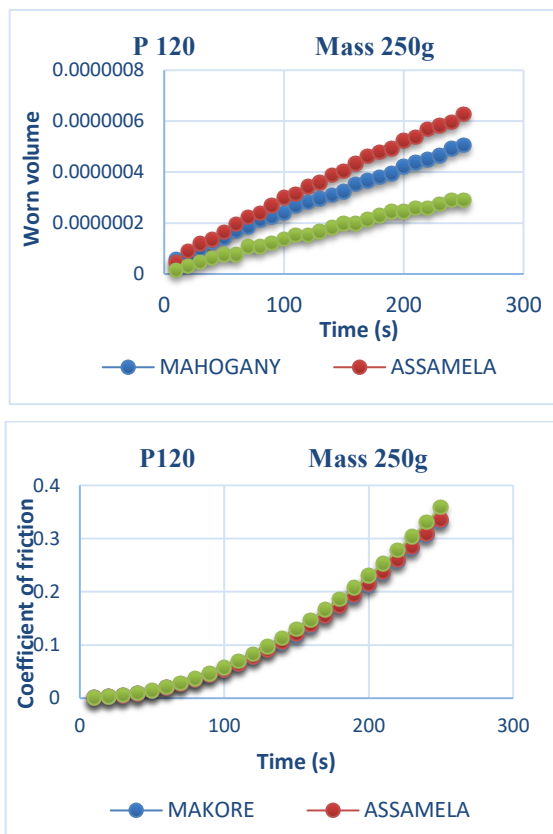
[Fig.3: (a) Abrasion Test Specimens, (b) Balance and (c) Abrasimeter]

III. RESULTS AND DISCUSSION

A. Evolution of Worn Volume and Coefficient of Friction Over Time

To examine the resistance to tearing of particles from makore, assamela, and mahogany species, specific physical and mechanical properties were determined and listed in Table 1. The analysis shows that makore is more elastic and less dense compared to assamela and mahogany. Figure 4 illustrates the variation in worn volume over time. Regardless of the size of the abrasive grains, the worn volume increases linearly with time for each species. The wear coefficient is then calculated from the linear range of wear volume curves as a function of time, as the wear volume (in) divided by the sliding distance (in m) and the applied load (in N).

By examining the curve in Figure 4, we observe that the coefficient of friction increases gradually over time, up to approximately 50 to 70 seconds (depending on the load P), and then increases rapidly beyond this range. This result indicates that the coefficient of friction increases exponentially with time. Indeed, the phase during which the coefficient of friction increases slightly corresponds to the adaptation of the real contact area of the couple. We transition from static friction to dynamic friction, and this process occurs more rapidly as the load P increases. The second phase, during which the coefficient of friction increases rapidly, indicates an established phase of the operating conditions at the contact interface. Initially, the real contact area is tiny. Over time, this contact area increases due to ageing and geometric rejuvenation of the contact interface. Moreover, the monotonous evolution of the dynamic friction force during the second phase suggests that the sliding does not replenish the population of microcontacts that carry the load.

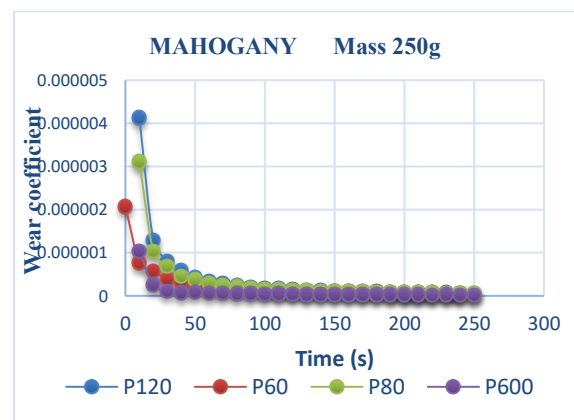


[Fig.4: Relationship Between: (a) Worn Volume (mm<sup>3</sup>) and Time (s) and (b) Dynamic Friction as a Function of time (s)]

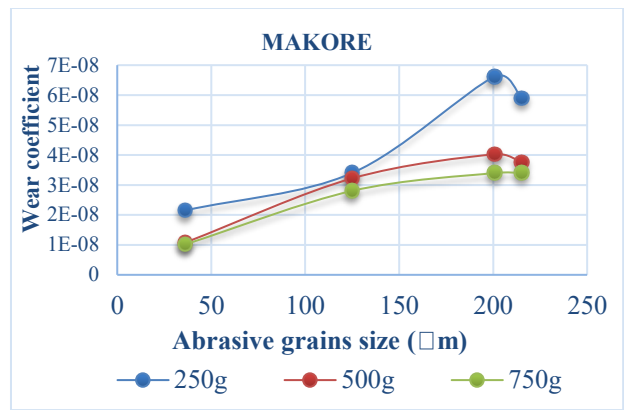
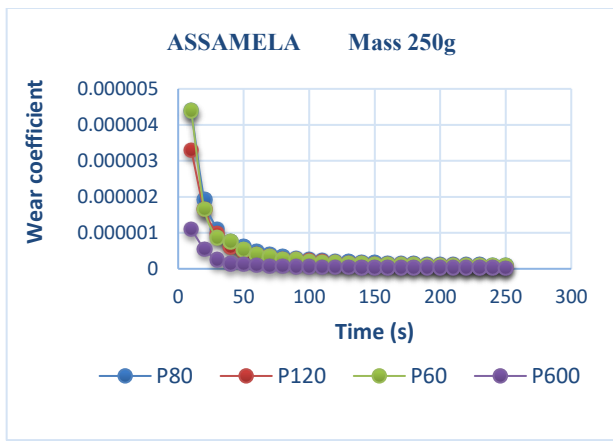
B. Influence of Abrasive Grain Size on the Wear Coefficient

The curves in Figure 5 clearly show the influence of abrasive grain size on the wear coefficient. It can be observed that the wear coefficient decreases as time increases. Indeed, the wear coefficient decreases rapidly during the first 50 seconds because, at the beginning of the slip, the states of the surfaces of the couple change rapidly. Beyond this instant, it becomes almost constant, i.e., independent of time, because the surfaces are nearly polished. It can also be noticed that the variation of the wear coefficient depends on the size of the abrasive grains [8]. Thus, to examine the effect of abrasive grain size on the wear coefficient in detail, we have plotted the curves in Figure 6. This is the evolution of the wear coefficient as a function of the size of the abrasive grains at time t = 250 s within different specimens. The wear rate within the three species is approximately the same. Table II shows the variation in the wear coefficient in the three species tested under loads of 250g, 500g, and 750g as a function of the size of the abrasive grains, P600, P120, P80, and P60.

The value of the wear coefficient in each of the curves in Figure 6 corresponding to each species increases with the size of the abrasive grains. It reaches a peak from which an irregularity is observed. This peak varies among the three species, depending on the changes in grain size of the abrasive wheels. For mahogany species, this change in tendency is observed when  $d > 150 \mu m$  and when  $d > 200 \mu m$  for makore and assamela species. Indeed, the limit value that indicates these observed effects is controlled by the elastic limit of the different materials as well as their microstructure. This irregularity is due to the change in abrasive grain size. Then, the result may occur because the critical effect of abrasive grain size has not been considered. Furthermore, the abrasion accelerates in contact with the abrasive grain and a vessel in a heterogeneous distribution of vascular cells. Indeed, the size of the abrasive grains at which the rate of wear increases irregularly corresponds to the values of the average size of the vessels of the vascular cells [9].



# Study of the Influence of the Charge and the Size of the Abrasive Grains on the Wear Resistance of Wood Particles: Application to Thieghemella Heckelii, Khaya Anthotheca and Pericopsis Elata



[Fig.6: Relationship Between Wear Coefficient and Average Abrasive Grain Size ( $\mu\text{m}$ )]

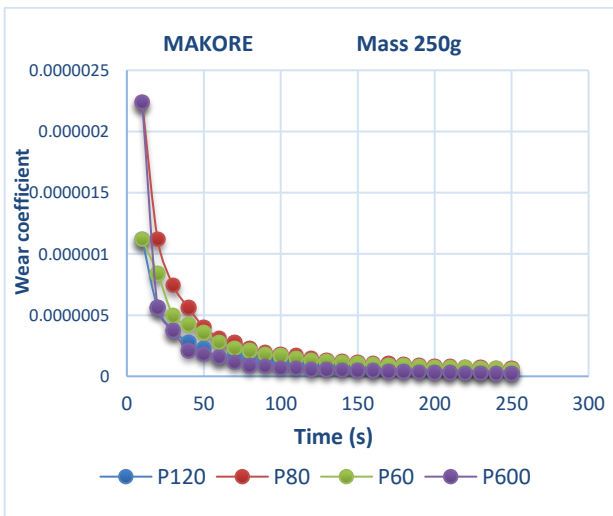
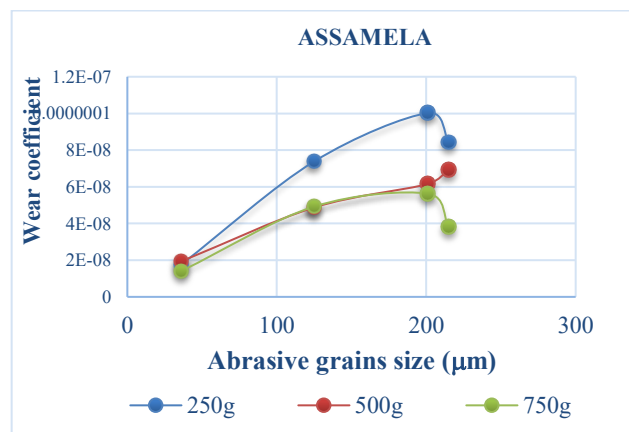
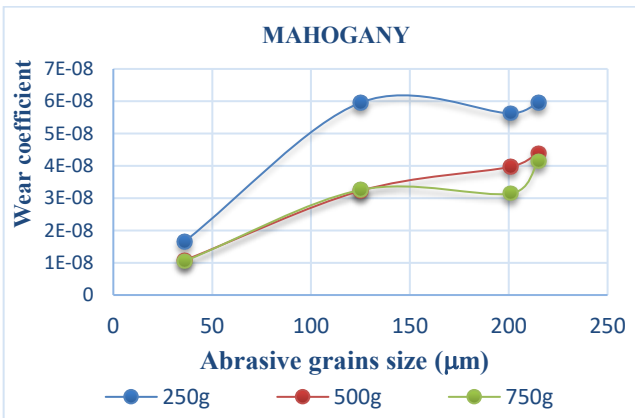


Table II: Variation of the Percentage Wear Coefficient of the Species According to the Size of the Abrasive Grains for Each Value of the Mass

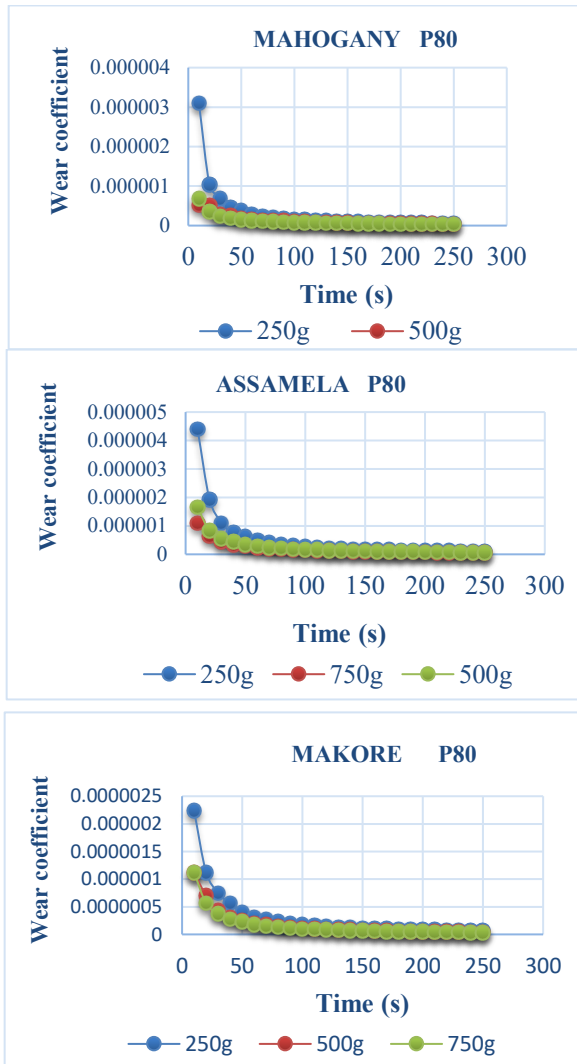
Species	Mass	Wear Coefficient Ratio in Percentage (%)		
		Between P600 and P120	Between P120 and P80	Between P80 and P60
Makore	250g	63%	51%	112%
	500g	33%	80%	107%
	750g	36%	82%	100%
Mahogany	250g	28%	106%	94%
	500g	33%	81%	91%
	750g	32%	104%	76%
Assamela	250g	24%	74%	119%
	500g	40%	79%	87%

[Fig.5: Evolution of the Worn Volume with Time and The Size of the Abrasive Grains]

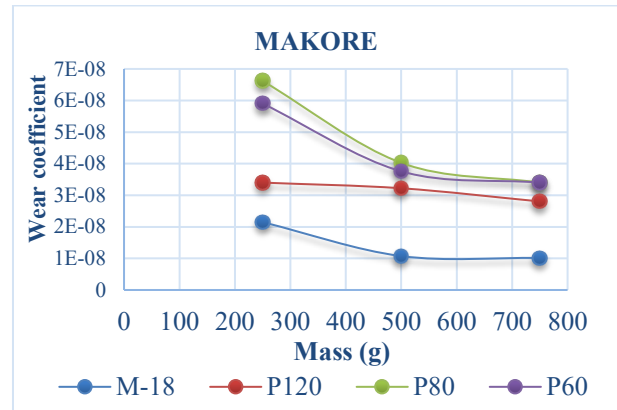
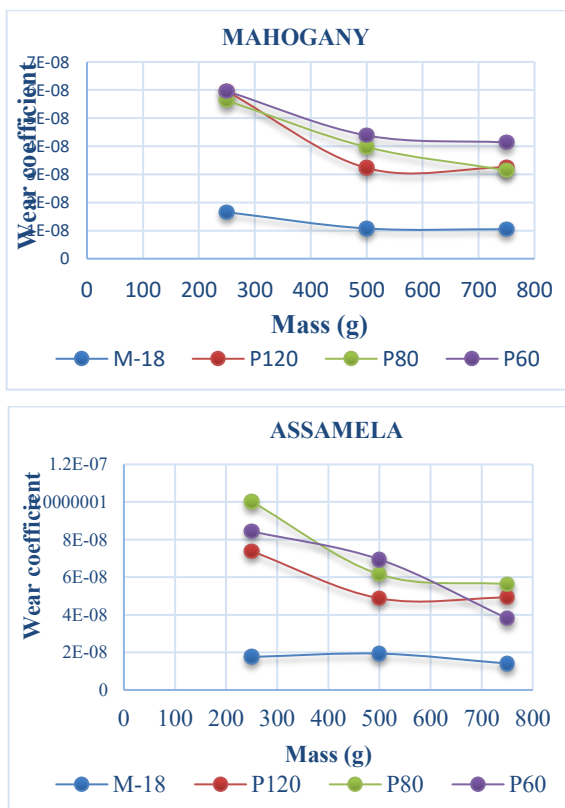


## C. Effect of Load on Wear Coefficient and Coefficient of Friction

The curves in Figure 7 provide a clear overview of the mass effect on the temporal evolution of the wear coefficient. Indeed, the greater the load, the lower the coefficient of wear over time. To examine the phenomenon more closely, the curves in Figure 8 were plotted at  $t = 250$  s. These curves illustrate the evolution of the wear rate as a function of the mass applied for different sizes of abrasive grains. For the majority of the specimens studied, the wear rate decreases rapidly when the mass increases by up to 500g, but beyond 500g, this decrease is moderate [10]. Table III shows the variation in the wear coefficient of species as a function of mass for each size of abrasive grains. For the P600 grit abrasive wheel, the wear rate remains almost constant beyond 500 g. The difference observed with the other specimens may be due to the rubbed surfaces. When the abrasive wheels come into contact (for a given level of load) with the surface to be stressed (perpendicular to the direction of the fibres), the abrasive grains easily tear off the particles of the fibres of early wood, unlike those of old wood.



[Fig.7: Evolution of the Wear Coefficient Over Time as a Function of the Load]



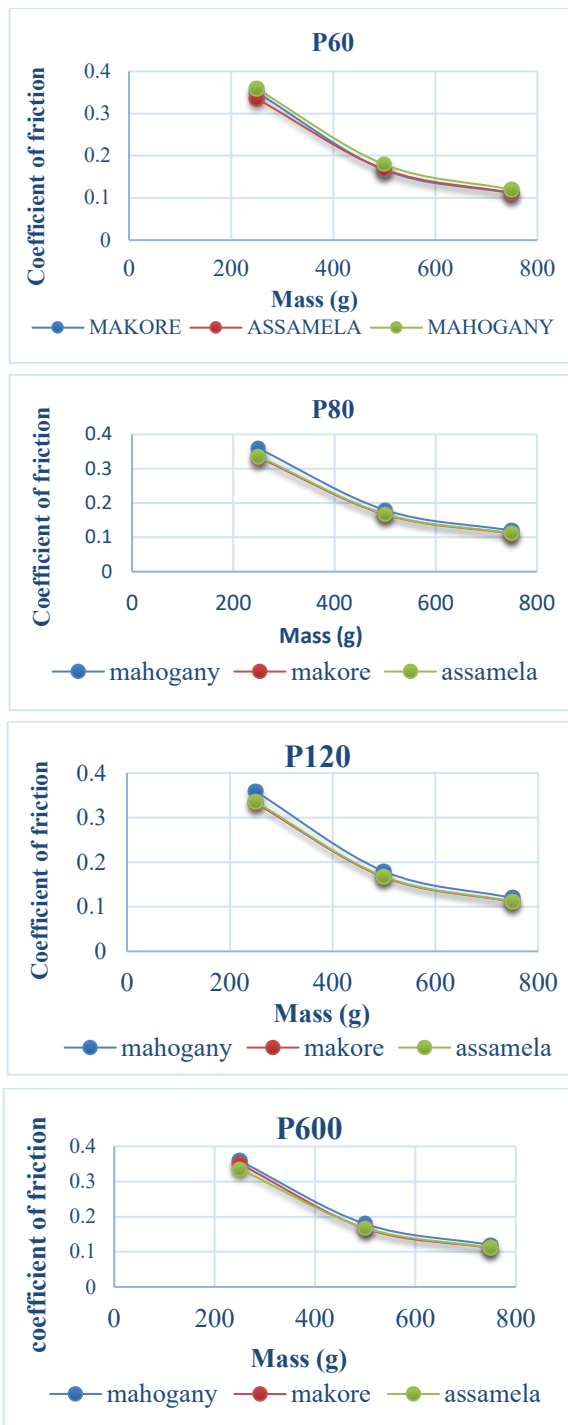
[Fig.8: Relationship Between the Wear Coefficient and the Mass of Species]

Table III: Variation in the wear Coefficient of Species as a Function of Mass for Each Size of Abrasive Grains

		Size of Abrasive Grains			
Species	Mass	P600	P120	P80	P60
Makore	Between 250g and 500g	50%	95%	61%	64%
	Between 500g and 750g	94%	87%	84%	90%
Mahogany	Between 250g and 500g	65%	54%	71%	74%
	Between 500g and 750g	97%	100%	79%	94%
Assamela	Between 250g and 500g	110%	66%	61%	82%
	Between 500g and 750g	73%	100%	91%	55%

Figure 9 gives the relationship between the coefficient of friction and mass. We observe that the coefficient of friction decreases as the mass increases, and this occurs in two phases. Indeed, it is noted that during the first phase, a rapid decrease in the coefficient of friction occurs. Specifically, when the mass doubles, the coefficient of friction decreases by 50% for assamala and mahogany, and by 47% for makore. However, during the second phase, a moderate decrease is observed, as the coefficient of friction decreases by 67% across the three species. Generally, an increase in load leads to a reduction in the coefficient of friction [11]. Indeed, at low loads, the surfaces cling together through the interweaving (entanglement) of the roughness of the opposing surfaces, thereby increasing the grip. On the other hand, when the load increases, the tangential force also increases, and the plastic deformations become more significant, thus favouring the tearing of the particles at the contact interface [12]. We also notice that makore resists abrasion a little more than mahogany and assamela. Indeed, the characterization of our essences reveals that makoré is more elastic than assamela and mahogany.

# Study of the Influence of the Charge and the Size of the Abrasive Grains on the Wear Resistance of Wood Particles: Application to Thieghemella Heckelii, Khaya Anthotheca and Pericopsis Elata



[Fig.9: Evolution of the Coefficient of Friction with Normal Load]

## IV. CONCLUSION

This study enabled us to provide answers to specific questions regarding the tearing resistance of particles from the makoré, mahogany, and assamela species subjected to a normal load in dry sliding contact. Based on the test results, we can draw the following conclusions:

- Note that among the species studied, makoré has the highest modulus of elasticity, followed by assamela and finally mahogany.
- The wear volume increases linearly with time in the three species.

- The coefficient of friction of our species grows exponentially over time, and this growth is the consequence of the increase in the static threshold and the ageing of the contact interface.
- The wear coefficient increases with the size of the abrasive grains until it reaches a maximum value from which irregular behavior is observed. Indeed, this is because the tearing of the particles occurs at all angles of attack on the contact surface of the couple. However, the size of the abrasive grains does not affect the coefficient of friction.
- It also emerges from this study that the wear coefficient decreases with increasing load up to a threshold, from which the decrease is moderate for abrasive wheels with large abrasive grain sizes and almost constant for grinding wheels. With petite grain sizes.
- The normal load has a significant effect on the friction behavior. When the load increases, the coefficient of friction decreases up to a certain threshold, from which it decreases moderately. Moreover, the coefficient of friction increases with the physical and mechanical properties of the species.

## ACKNOWLEDGMENT

We would like to extend our warmest thanks to all the authors who contributed to the implementation of this project.

## DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/Competing Interests:** Based on my understanding, this article does not have any conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted with objectivity and without any external influence.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed equally to all participating individuals.

## REFERENCES

1. Hutchings, I., & Shipway, P. (2017). *Tribology: friction and wear of engineering materials*. Butterworth-heinemann. [https://books.google.ca/books?hl=fr&lr=&id=LNmEQAAQBAJ&oi=fnd&pg=PP1&dq=Tribology:+friction+and+wear+of+engineering+materials.+Butterworth-heinemann.&ots=0c8rPzwnb6&sig=O17IFc\\_EXrT0rKhxzenLq9UKQ\\_U&redir\\_esc=y#v=onepage&q=Tribology%3A%20friction%20and%20wear%20of%20engineering%20materials.%20Butterworth-heinemann.&f=false](https://books.google.ca/books?hl=fr&lr=&id=LNmEQAAQBAJ&oi=fnd&pg=PP1&dq=Tribology:+friction+and+wear+of+engineering+materials.+Butterworth-heinemann.&ots=0c8rPzwnb6&sig=O17IFc_EXrT0rKhxzenLq9UKQ_U&redir_esc=y#v=onepage&q=Tribology%3A%20friction%20and%20wear%20of%20engineering%20materials.%20Butterworth-heinemann.&f=false)
2. Deng, T. (2025). Erosive Wear Mechanisms of Materials—A Review of Understanding and Progress. *Materials*, 18(7), 1615.



- DOI: <https://doi.org/10.3390/ma18071615>
3. Trzpieciński, T., Szwajka, K., Zielińska-Szwajka, J., & Szewczyk, M. (2025). Current trends in monitoring and analysis of tool wear and delamination in wood-based panel drilling. *Machines*, 13(3), 249. DOI: <https://doi.org/10.3390/machines13030249>
  4. Al-Samarai, R. A., & Al-Douri, Y. (2024). *Friction and Wear in Metals*. Berlin/Heidelberg, Germany: Springer. DOI: <https://doi.org/10.1007/978-981-97-1168-0>
  5. Liu, M., Lyu, S., Peng, L., Fan, Z., Cai, L., Huang, Z., & Lyu, J. (2022). Study on properties of radiata pine wood treated with furfuryl alcohol as fretboard materials for string instruments. *European Journal of Wood and Wood Products*, 80(5), 1185-1200. DOI: <https://doi.org/10.1007/s00107-022-01829-z>
  6. Friedrich, K., Akpan, E. I., & Wetzal, B. (2021). On the tribological properties of significantly different wood materials. *European Journal of Wood and Wood Products*, 79(4), 977-988. DOI: <https://doi.org/10.1007/s10007-020-01654-2>
  7. Friedrich, K., Akpan, E. I., & Wetzal, B. (2017). Structure and mechanical/abrasive wear behavior of a purely natural composite: black-fiber palm wood. *Journal of Materials Science*, 52(17), 10217-10229. DOI: <https://doi.org/10.1007/s10853-017-1184-5>
  8. Trevisiol, C., Jourani, A., & Bouvier, S. (2017). Effect of hardness, microstructure, normal load and abrasive size on friction and wear behaviour of 35NCD16 steel. *Wear*, 388, 101-111. DOI: <https://doi.org/10.1016/j.wear.2017.05.008>
  9. Asif, I. M. (2018). Characterisation and Biological Impact of Wear Particles from Composite Ceramic Hip Replacements (Doctoral dissertation, University of Leeds). [https://etheses.whiterose.ac.uk/id/eprint/20563/1/Asif\\_I.M\\_School%20of%20Mechanical%20Engineering\\_PhD\\_2018.pdf](https://etheses.whiterose.ac.uk/id/eprint/20563/1/Asif_I.M_School%20of%20Mechanical%20Engineering_PhD_2018.pdf)
  10. Shinde, D. M., Poria, S., & Sahoo, P. (2020). Dry sliding wear behaviour of ultrasonically stirred cast boron carbide-reinforced aluminium nanocomposites. *Surface Topography: Metrology and Properties*, 8(2), 025033. DOI: <http://doi.org/10.1088/2051-672X/ab9d71>
  11. Bekhouche, D., Bouchoucha, A., Zaidi, H., & Mouadji, Y. (2016). étude de l'influence du parametre charge sur le comportement en frottement et usure du couple dynamique sec bronze-acier. *Sciences & Technologie*, B, Sciences de l'ingénieur, 17-21. <https://revue.umc.edu.dz/b/article/view/2136/2279>
  12. Mekicha, M. A., de Rooij, M. B., Mishra, T., Matthews, D. T. A., Jacobs, L., & Schipper, D. J. (2021). Study of wear particle formation at single asperity contact: An experimental and numerical approach. *Wear*, 470, 203644. DOI: <https://doi.org/10.1016/j.wear.2021.203644>

### AUTHOR'S PROFILE



**Ngouffo Koukougang René** is an Assistant Lecturer at the University of Buea, Higher Technical Teacher Training College (HTTTC), KUMBA, Department of Mechanical Engineering. I hold a PhD in Energy Mechanics and a Master of Science degree with a thesis in Mechanics, Materials, Structure, and

Productivity, as well as a Second-Degree Technical Teaching Diploma (DIPET 2) in Mechanical Manufacturing (FM). My research focuses on the valorisation of secondary resources (wastes and others) in sustainable construction. My expertise includes recycling resources and sustainable engineering and civil engineering practices. I also work on the wear of materials, including the loss of mass, by removing materials from wood and recycling plastic waste in sustainable construction.



**Takoudjou Talla Aubin** is a PhD student in Physics at the University of Dschang. He holds a Bachelor's and Master's degree in Mechanical and Energy Engineering. His doctoral research focuses on sustainable technological applications, aiming to develop innovative solutions adapted to local contexts.

In addition to his academic background, he has worked as a secondary school teacher in technical drawing. Currently, he serves as a general technician at DEW Engineering and Development ULC in Canada. His areas of expertise include thermal fluid systems, energy efficiency, computational modelling, and sustainable engineering practices. He is passionate about bridging the gap between academic research and practical industrial needs.



**Azeufack Tonfack Ulrich Gael** is a lecturer at the University of Buea, Faculty of Engineering and Technology, Department of Mechanical and Industrial Engineering. He holds a PhD and a Master of Science degree with a thesis in Energy Mechanics. He has a

Master's degree and a Bachelor's degree in Physics, with a specialisation in Mechanical Engineering. He contributes to the study of wood material

damage in the case of Pericopsis elata. He possesses skills and expertise in material characterisation, mechanical properties, mechanical testing, Engineering research methodology, mechanics of materials, Damage mechanics, finite element analysis, Plasticity, Elasticity, continuum mechanics, and Homogenization. He is passionate about research, especially experimental research.



**Claude Takoumbe**. PhD in mechanics and production engineering (GMP) and holder of a Master 2 Research (M2R) in Computer-Aided Manufacturing (FAO) and a Second-Degree Technical Teaching Diploma (DIPET 2) in Mechanical Manufacturing (FM). His research

focuses on the valorization of plant by-products for sustainable technological applications, to develop innovative solutions adapted to local contexts. Her areas of expertise include the physical, chemical, mechanical, and thermal characterisation of fibres, shells, and composites. Analysis of chemical and microstructural properties such as SEM images, FTIR, EDX and XRD spectra, and TGA thermograms. Analysis of mechanical, thermomechanical, hydro and hygromechanical properties.



**Mabekou Takam Jeanne Sandrine** is an Associate Professor at the University of Cameroon, specifically at the University of Dschang, Department of Physics, Faculty of Sciences. Her research falls within the broad field of non-linear dynamics of complex systems, with

applications in modelling, analysis, and digital implementation of electromechanical, physical, and biological systems. Indeed, she studies the analytical, digital, and practical implementation of non-linear dynamic systems, control of system dynamics, and their applications. Furthermore, in non-linear physics, they study the physico-mechanical properties of electromechanical, biological and materials. In addition, they are considering new theoretical and experimental approaches for improving the production and distribution of electrical energy, and they analyse energy recovery from transducers on surrounding mechanical vibrations.



**Talla Kisito Pierre Kisito** is a Professor at the University of Cameroon, and more specifically at the University of Dschang, Department of Physics, Faculty of Sciences. His research falls within the broad field of non-linear dynamics of complex systems, with applications in

modelling, analysis, and digital implementation of electromechanical, physical, and biological systems. Indeed, she studies the analytical, digital, and practical implementation of non-linear dynamic systems, control of system dynamics, and their applications. His work focuses on the Characterisation of materials and dynamics in non-linear physics. He contributes to the study of wood material damage in the case of Pericopsis elata.

**Disclaimer/Publisher's Note :** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)/ journal and/or the editor(s). The Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP) and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.