****

**EXPERIMENTAL THERMOCHEMICAL, PHYSICAL AND MECHANICAL CHARACTERIZATION OF T.02% OFDURA PALMKERNEL SHELL POWDER**

 ***(Corresponding author Email:*** *rdmi@yahoo.fr****)***

|  |  |
| --- | --- |
| **Rolland Djomi1\*, Joseph Voufo1, Christian Bopda Fokam1, Claudel Hamka1, Chantal Marguerite Mveh2, Abel Tanbé3** | 1Civil and Mechanical Engineering Laboratory, National Advanced School of Engineering, University ofYaounde1, Yaounde, Cameroon.2Applied computer science laboratory, National Advanced School of Engineering, University of Yaounde 1, Yaounde, Cameroon.3Laboratory of Physical Chemistry of Mineral Materials Faculty of Science University of Yaounde 1 Yaounde, Cameroon. |
| [**https://grpublication.com/index.php/ijrisat**](https://grpublication.com/index.php/ijrisat)**- (upto Vol.5)** **Received: 28th Nov.2021; Revised: No****Accepted: 23rd Dec. 2021; Published: 23rd Jan. 2022** | **Vol.No.6,** [**https://www.ijrisat.com**](https://www.ijrisat.com)**Issue No.1, January, 2022** |

**ABSTRACT**

We have carried out here a chemical, thermal, physical characterization and a study of the mechanical behavior to the tubular compression of the PVC tubes loaded with 0%, 12.54% and 51.02% of the dura palm kernel shell powder obtained by extrusion and give an approach on its use.

**KEYWORDS:** PVC tubes loaded with palm kernel shell powder, ATG/DSC, FTIR, water absorption, mechanical behaviour under uniaxial tubular compression.

1. **INTRODUCTION**

Plastics are increasingly in demand by engineers at the expense of metallic materials. This is due to the multiple properties they offer in many areas of construction. According to the literature, their use is increasing in industries such as aerospace, automotive, shipbuilding, construction and many others [1]. Plastics from synthetic polymers are widely used due to their availability and relatively low cost, but they have certain properties that need to be improved such as biodegradability. For several decades, work has been done on the use of vegetable loads to solve these problems, particularly in the form of reinforcements [2, 3].

The oil palm is a by uniaxial tubular compression.

1. **MATERIALS AND METHODS**

**2 .1 Materials**

**Resin:** the resin used is the PVC described in the work of Djomi el al [4] of the company DANSUK et Cie [10].

**Load:** the load used is micronized dura palm kernel shell powder.The shell powder is the one obtained according to the methodology described in the work described by Djomi et al in 2018 [4].

**Additive:** The additives are those described in the work of Djomi et al [4-7].

**2.2 Material**

**2.2.1 Thermal Analysis**

**Thermogravimetric and thermo differential analysis:** we used a LINSEIS STA PT-1000 C We carry out the analyses in the Laboratories of Physicochemistry of Materials of the Faculty of Sciences of the University of Yaounde 1, Cameroon.

The actual density ρ is the average of the 6 densities of the specimens obtained in each formulation.

$ρ\_{v}= \frac{4m\_{i}}{πL\_{i}(D\_{e}^{2}- d\_{i}^{2})}$

(1)

1. **RESULTS AND DISCUSSION**

**3.1 Extrusion result**

|  |
| --- |
| C:\Users\UTILIS~1\AppData\Local\Temp\IMG_20210911_134608.jpgC:\Users\pc\Desktop\CLICHE  DJOMI  TUBES COMPLET\IMG-20210916-WA0038 - Copie.jpgC:\Users\pc\Desktop\CLICHE  DJOMI  TUBES COMPLET\IMG-20210916-WA0029 - Copie.jpgFigure (a) Figure (b) Figure (c)**Figure 1:** Extruded PVC tubes loaded with 0%, 12.54%, 51.2% of palm kernel shell powder |

**3.1. Subsection**

**3.1.1. Subsubsection**

Bulleted lists look like this:

* First bullet;
* Second bullet;
* Third bullet.

Numbered lists can be added as follows:

1. First item;
2. Second item;
3. Third item.

The text continues here.

**Table 1:** Density of PVC tubes loaded with palm kernel shell powder

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Formulations**  | **F0** | **F12.54** | **F51.02** | **Units.** |
| Density of PVC tubes loaded with palm kernel shell powder. | 1.42±0.021 | 1.38 ±0.015 | 1.23 ±0.035 | g/cm3 |

1. **DISCUSSION**

The DSC results obtained on the samples with high load percentage give very close results to the Tg and Tce. This glass transition value (Tg) obtained shows the effectiveness of the temperature resistance of PVC/shell powder.Thepresence of shell powder with high percentage of load presents a good degradation of the material at the end of life (17) (2) (18).

Going through the observations obtained in the above characterizations, we obtain that the palm kernel shell powder as a load in the elaborated plastic material offers advantages as:

In the environmental pollution, from the point of view of its thermal behavior, water absorption power shells and reinforced with fibers.

1. **CONCLUSION**

In recent years, new plastic materials have been created in the research world. The validation of a material goes through a series of characterizations that allow it to find an application in the industry. PVC tubes then rigid, brittle for 51.02% loaded tubes were obtained. These results show that the PVC tubes loaded with shell powder constitute a new plastic material which deserves to be studied particularly for the fields of activity such as aeronautics, automobile, construction, toys for entertainment and laboratory materials.

**Acknowledgments:** In this section, you can acknowledge any support given which is not covered by the author contribution or funding sections. This may include administrative and technical support, or donations in kind (e.g., materials used for experiments).

**Conflicts of Interest:** Declare conflicts of interest or state “The authors declare no conflict of interest.” Authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results. Any role of the funders in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript, or in the decision to publish the results must be declared in this section. If there is no role, please state “The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results”.

**REFERENCES**

**(Use APA Style for referencing and citation)**

References must be numbered in order of appearance in the text (including citations in tables and legends) and listed individually at the end of the manuscript. We recommend preparing the references with a bibliography software package, such as EndNote, ReferenceManager or Zotero to avoid typing mistakes and duplicated references. Include the digital object identifier (DOI) for all references where available.

Manually you can use google scholar for citation and style formatting.

Decreasing order year of publication

- M.T.B. and HamdanAriffin, A. (2018),

- Y. M., Grohens, Y., &Pillin, I. (2017),

- Augier, L. (2016),

- Atangana, A. (2012),

-Atangana, A. (2012),

- Atangana, A. (2012),

- Gamper, A. and Stefan, W. (2011)

-and so on…

Citations and references in the Supplementary Materials are permitted provided that they also appear in the reference list here.

In the text, reference numbers should be placed in square brackets [ ] and placed before the punctuation; for example [1], [1–3] or [1,3]. For embedded citations in the text with pagination, use both parentheses and brackets to indicate the reference number and page numbers; for example [5] (p. 10), or [6] (pp. 101–105).

[1] Han, T., Hameed Sultan, M.T.B. and HamdanAriffin, A. (2018), The Challenges of Natural Fiber in Manufacturing, Material Selection, and Technology Application: A Review. Journal of Reinforced Plastics and Composites, 1-10. <https://doi.org/10.1177/0731684418756762>.

[2] Hammiche, D., Boukerrou, A., Djidjelli, H., Corre, Y. M., Grohens, Y., &Pillin, I. (2017), Hydrothermal ageing of alfa fiber reinforced polyvinylchloride composites. Construction and Building Materials, 47, 293-300.<https://doi.org/10.1016/j.conbuildmat.2013.05.078>.

[3] Augier, L. (2016), Etude de l’élaboration de matériaux composites PVC/bois à partir de déchets de menuiserie: formulation, caractérisation, durabilitéet recyclabilité (Doctoral dissertation). URL: <http://ethesis.inp-toulouse.fr/archive/00002291/>

[4] Djomi, R., Meva’a, L. J. R., Nganhou, J., Mbobda, G., Njom, A. E., Bampel, Y. D. M., &Tchinda, J. B. S. (2015), Physicochemical and Thermal Characterization of Dura Palm Kernel Powder as a Load for Polymers: Case of Polyvinyl Chloride. Journal of Materials Science and Chemical Engineering, 6(6), 1-18. DOI:[10.4236/msce.2018.66001](https://doi.org/10.4236/msce.2018.66001).

[5] Misse, S. E., Obounou, M., Ohandja, L. A., &Caillat, S. (2014), Utilisation des coques de noix de palmistecomme combustible dansun four de fusion de la ferraille. Journal of Renewable Energies, 16(1), 75-89.

[6] Hidayu, A.R., Mohamad, N.F., Matali, S. and Sharifah, A.S.A.K. (2013), Characterization of Activated Carbon Prepared from Oil Palm Empty Fruit Bunch Using BET and FT-IR Techniques. Procedia Engineering, 68, 379-384.

<https://doi.org/10.1016/j.proeng.2013.12.195>.

[7] Djomi, R., Fokam, C. M., Biyeme, F., Mveh, C. M., Olembé, R., Ntede, H., &Atangana, A. (2012), Industrial Elaboration by Extrusion of PVC Tubes Loaded with Micronized Dura Palm Kernel Shell Powder. Journal of Materials Science and Chemical Engineering, 9(10), 41-69. DOI:[10.4236/msce.2021.910004](https://doi.org/10.4236/msce.2021.910004).

[8] Elachaby, F. (2012), Mechanical and Thermal Properties of Polypropylene Reinforced with Alfa Fiber under Different Chemical Treatment. Materials and Design, 35, 318-322. <https://doi.org/10.1016/j.matdes.2011.09.023>.

[9] Dietsch, P., Franke, S., Franke B., Gamper, A. and Stefan, W. (2011) Methods to Determine Wood Moisture Content and Their Applicability in Monitoring Concepts. Journal of Civil Structural Health Monitoring, 5, 115-127. <https://doi.org/10.1007/s13349-014-0082-7>.