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Original Research Article

The effect of oven dry density on after glow time of fifty-two selected Nigerian timbers

P.Udeozo Ifeoma[1,2]*

[1]Department of Chemical Sciences, Tansian University Umunya, Anambra State, Nigeria
[2]Department of pure and Industrial Chemistry, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria
**Corresponding author*

Keywords

Oven dry density Nigerian timbers and woods.

A B S T R A C T

The effects of after-glow time on oven dry density of fifty two selected Nigeria timbers were analyzed. The timber; *Uapaca guineensis* with the highest AGT (719.33sec) had the ODD of 31.4 x10^{-2} g.cm^{-3}. The timber; *Afzelia bipindensis* with the least AGT (49.33sec) had the ODD of 51.4 x 10^{-2}g.cm^{-3}. The two timbers *Spathodea campanulata* and *Erythropleum ivorense* with zero AGT had their ODD as 30.1 x10^{-2} g.cm^{-3} and 108.7 x10^{-2} g.cm^{-3} (highest ODD) respectively and are good fire resistant timbers. There was no relationship between ODD and AGT from the results of this analysis.

Introduction

A tree is a large woody plant with main stem called trunk that does not usually branch until several feet from the ground. Trees are also perennials and taller than shrubs. It is sometimes difficult to distinguish a shrub from a tree due to there are some plants such as Croton and *Baphia nitida* which usually remain as shrubs but may occasionally grow as tall as a tree. The size of a tree also varies with the climate, the depth and type of soil in which it grows (Ike, 2007). Timbers are known as trees grown to be used in building or for making other things. It can be referred to as wood prepared for use in building or for making other things. Wood is the most important natural and endlessly renewable source of energy which has a major future role as an environmentally cost-effective alternative to burning fossils fuel (Bashiru and Eboatu 1990). The major role of wood is not only the provision of energy but also the provision of energy-sufficient material for our buildings and many other products. In addition, developing wood cells represent one of the most important sinks for excess atmospheric CO_2, thereby reducing one of the major contributors to global warming (Stone et al., 1991).

Wood is the fifth most important product of the world trade. Furthermore the vast quantities of wood are logged by foresters

to provide fuel, fibres (for pulp, paper products and boards) and sawn timbers (for house building and furniture) as commodities. The complex chemical make up of wood (cellulose, hemicelluloses, lignin and pectins) also makes it an ideal raw material for what could be a future "ligno-chemical" industry that could replace the petrochemical industry in providing not only plastic and all kinds of chemical products but also food and textile products (Bashiru and Eboatu (1990). The quality of timber depends on its heat, moisture and susceptibility to insect attacks, workability, grains, colour, porosity and capacity to take polish and vanish (Eboatu et al., 1990) and (Feirer John, 2000).

In Nigeria, over 4600 plant species & 350 timbers have been identified (Esau,. 2007). This is without enough characterizations like those in the developed countries. This study attempts to address this by checking the oven dry density on after-glow time of 52 timbers from Nigeria.

Materials and Methods

Sample Collection and Preparation

The Fifty- two (52) timber samples were collected from fourteen States in Nigeria. The States are Anambra, Enugu, Ebonyi, Imo, Delta, Edo, Cross River, Akwa Ibom, Abia, Oyo, Lagos, Kano, Sokoto and Rivers State.The timber samples were obtained from the timber sheds at Nnewi, Awka, Enugu, Abakaliki and Benin. The States from where these timbers were collected were ascertained from timber dealers and confirmed by literature (Esau, 2007; Akindele and LeMay , 2006). The timber dealers were able to give the Local or common names of the timbers while the botanic names were obtained with the aid of forest officers and the literature Esau, 2007; Akindele and LeMay , 2006).

The samples were taken to the saw mill at Nnewi Timber Shed where each timber was cut into two different shapes and sizes. Also dust from each timber was realized. The timbers were cut into splints of dimensions 30x 1.5 x 0.5cm and cubes of dimensions 2.5cm x2.5cmx 2.5cm i.e. 15.625 cubic centimeters. The splints were dried in an oven at 105^0C for 24 h before the experiments.

Determination of Afterglow time (AGT) of the timbers

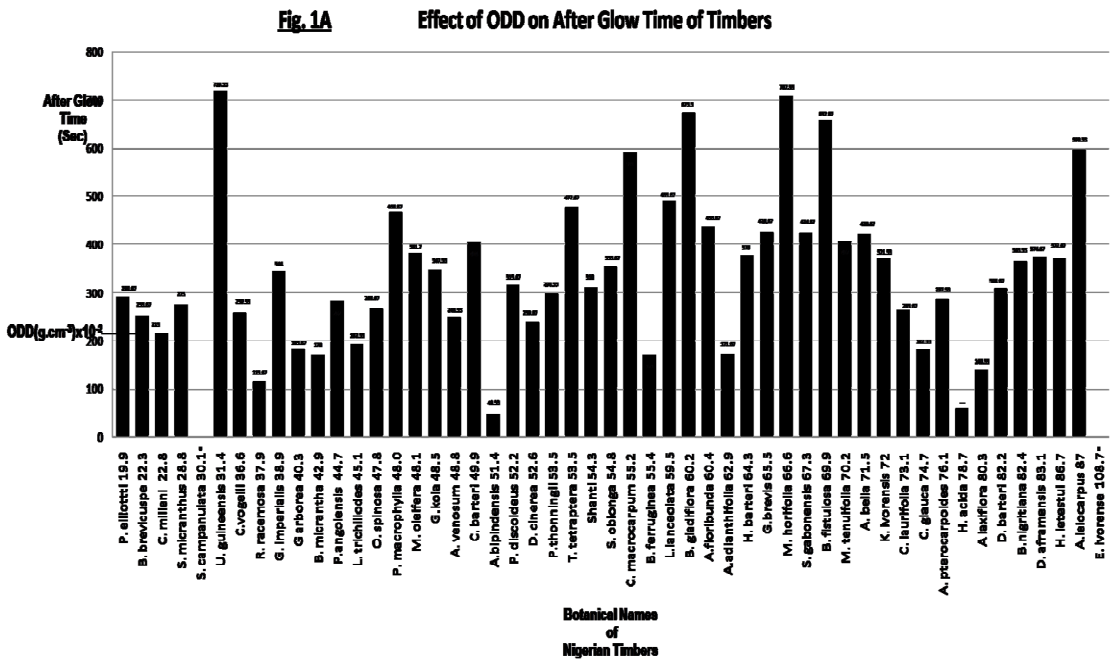
The After-Glow Times were obtained by noting the time in seconds between flame extinction and the last visually perceptible glow. The average of the three splints readings for each timber sample was used. In other words after-glow time is the time it takes the glow to disappear after the flame was put off.

Determination of Oven Dry Density ODD

Three 2.5cm cubes of each timber sample were randomly selected. Each was weighed with top loading balance, Make: Mettler Toledo, Model: PL 203. After recording the initial weight, the sample was transferred into the drying oven at the temperature of 105^oC. The sample was left in the oven for three hours. After the heating, the oven was switched off, and the sample left overnight to cool. The sample was re-weighed after twelve hours. Care was taken to ensure that sample did not absorb moisture before and during weighing. After recording the second weight for the respective samples, they were taken back into the oven for another three hours at the same temperature. This was repeated until any two subsequent

Table.1 Names of the selected fifty-two (52) timbers used for this research

S/NO	BOTANICAL NAMES	IGBO NAMES	YORUBA NAMES	HAUSA NAMES	AREAS OF LOCATION IN NIGERIA
1.	*Monodora tenuifolia*	*ehuru ofia*	*lakesin*	*gujiyadanmiya*	*Port Harcourt*
2.	*Pycnanthus angolensis*	*Akwa-mili*	*akomu*	*akujaadi*	*Calabar, Awka*
3.	*Moringa oleifera*	*okwe oyibo*	*ewe igbale*	*zogallagandi*	*Lagos, Ibadan*
4.	*Protea elliottii*	*okwo*	*dehinbolorun*	*halshena*	*Nsukka*
5.	*Caloncoba glauca*	*udalla-enwe*	*kakandika*	*alibida*	*Onitsha*
6.	*Barteria nigritiana*	*ukwoifia*	*oko*	*idonzakara*	*Nsukka, Enugu*
7.	*Bacteria fistulosa*	*oje*	*oko*	*kadanya*	*Awka*
8.	*Anogeissus leiocarpus*	*atara*	*ayin*	*marike*	*Onitsha, Awka*
9.	*Rhizophora racemosa*	*ngala*	*egba*	*loko*	*Calabar*
10.	*Allanblackia floribunda*	*egba*	*eku,eso roro*	*guthiferae eku*	*Calabar, Ikom*
11.	*Garcinia kola*	*adi*	*orogbo*	*namijin-goro*	*Onitsha*
12.	*Glyphae brevis*	*anyasu alo*	*atori*	*bolukonu kanana*	*Calabar*
13.	*Hildegaridia barteri*	*ufuku*	*eso, shishi*	*kariya*	*Okigwe*
14.	*Sterculia oblonga*	*ebenebe*	*oroforofo*	*kukuki*	*Ibadan*
15.	*Cola laurifolia*	*ufa*	*aworiwo*	*karanga*	*Onitsha*
16.	*Bombax brevicuspe*	*akpudele*	*awori*	*kurya*	*Ikom*
17.	*Bridelia micrantha*	*ogaofia*	*ida odan*	*kirni*	*Calabar*
18.	*Bridelia ferruginea*	*ola*	*ira odan*	*kirni and kizini*	*Onitsha*
19.	*Uapaca guineensis*	*Obia*	*abo-emido*	*wawan kurmi*	*Onitsha*
20.	*Antidesma venosum*	*okoloto*	*aroro*	*kirni*	*Onitsha, Udi*
21.	*Parinari robusta*	*ohaba-uji*	*idofun*	*kasha-kaaji*	*Onitsha*
22.	*Cynometra vogelii*	*ubeze*	*anumutaba*	*alibida*	*Onitsha*
23.	*Amphimas pterocarpoids*	*awo*	*ogiya*	*waawan kurmii*	*Umuahia*
24.	*Lovoa trichiliodes*	*sida*	*akoko igbo*	*epo-ipa*	*Calabar*
25.	*Berlinia grandiflora*	*ububa*	*apodo*	*dokar rafi*	*Enugu*
26.	*Albizia adianthifolia*	*avu*	*anyimebona*	*gamba*	*Enugu*
27.	*Oncoba spinosa*	*akpoko*	*kakandika*	*kokochiko*	*Onitsha*
28.	*Dichapetalum barteri*	*ngbu ewu*	*ira*	*kirni*	*Onitsha*
29.	*Afzelia bipindensis*	*aja*	*olutoko*	*rogon daji*	*Benin*
30.	*Afzelia bella*	*uzoaka*	*peanut*	*epa*	*Owerri, Orlu*
31.	*Erythropleum ivorense*	*inyi*	*erun*	*idon zakara*	*Ogoja, Ijebu*
32.	*Dichrostacys cinerea*	*amiogwu*	*kara*	*dundu*	*Onitsha*
33.	*Pentaclethra macrophylla*	*ugba*	*apara*	*kiriya*	*Onitsha*
34.	*Tetrapleura tetraptera*	*oshosho*	*aridan*	*dawo*	*Onitsha*
35.	*Stemonnocoleus micranthus*	*nre*		*waawan kurmi*	*Ukpor*
36.	*Piliostigma thonningii*	*okpoatu*	*abafe*	*kalgo*	*Kano,Oyo*
37.	*Hymenocardia acida*	*ikalaga*	*orupa*	*jan yaro*	*Awka*
38.	*Afrormosia laxiflora*	*abua ocha*	*shedun*	*don zakara*	*Sokoto*
39.	*Phyllanthus discoideus*	*isinkpi*	*ashasha*	*baushe*	*Enugu, Ikom*
40.	*Gardenia imperialis*	*uli*	*oroto*	*karandafi*	*Jos*
41.	*Macaranga hurifolia*	*awarowa*	*ohaha*		*Awka*
42.	*Sacoglottis gabonensis*	*nche*	*atala*	*chediya*	*Rivers*
43.	*Cassipourea barteri*	*itobo*	*odu*	*daniya*	*Eket*
44.	*Combretodendron macrocarpum*	*anwushi*	*akasun*		*Udi*
45.	*Lophira lanceolata*	*okopia*	*iponhon*	*namijin kadai*	*Udi*
46.	*Homalinum letestui*	*akpuruukwu*	*out,obo-ako*		*Ikom*
47.	*Cordial millenii*	*okwe*	*omo*	*waawan kurmii*	*Owerri*
48.	*Gmelina arborea*	*gmelina*	*igi Melina*	*kalankuwa*	*Ibadan*
49.	*Drypetes aframensis*		*tafia*		
50.	*Khaya ivorensis*	*ono*	*oganwo*	*madachi*	*Calabaar*
51.	*Spathodea campanulata*	*imiewu*	*oruru*	*delinya*	*Onitsha*
52.			*Shanty*		



weights were equal i.e. constant weight attained. The weight of a cube was obtained by calculating the average of the three samples of each timber. The volume of each timber sample was calculated by taken the dimensions of the three 2.5cm cubes of each timber sample. The average volume of the three samples was recorded as the volume of each sample of the timbers. The oven dry density of each timber sample was determined by dividing the average oven dry weight of the three samples by the average volume of three samples.

$$\textbf{ODD} = \frac{\text{Average dry weight of samples}}{\text{Average volume of samples.}}$$

Results and Discussion

Figure 1A is the graph of afterglow time (AGT) against ODD. The timber; *Uapaca guineensis* with the highest AGT (719.33sec) had the ODD of 31.4 $x10^{-2}$ $g.cm^{-3}$. The timber; *Afzelia bipindensis* with the least AGT (49.33sec) had the ODD of 51.4 x $10^{-2}g.cm^{-3}$. The two timbers *Spathodea campanulata* and *Erythropleum ivorense* with zero AGT had their ODD as 30.1 $x10^{-2}$ $g.cm^{-3}$ and 108.7 $x10^{-2}$ $g.cm^{-3}$ (highest ODD) respectively. It is therefore clear from this Figure, that there is neither direct nor inverse relationship between afterglow time and oven dry density of the fifty-two timbers that were analyzed.

This observation is supposed to be the intended outcome bearing in mind the assertion of Browne and Horrocks (1958) and (Eboatu, 1991). Since the percentage composition of fuel in the various timber samples were not studied, the observation is in order. Furthermore, apart from the primary source (wood) even the size and nature of char also play some role on AGT, and this no doubt complicates the result.

The results of this analysis suggest that there is neither direct nor inverse relationship between afterglow time and oven dry density of the fifty-two timbers that were analyzed.

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