IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10651

ASSESSING RESISTANCE IN FOOD WASTES THROUGH THE ACTIVATED CARBON POWDER WITH ABSORBENT ANALYSIS WITH ECO FRIENDLY MATERIALS

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Abstract: Natural food waste is a significant contributor to environmental degradation, with landfills containing tonnes of this waste material, which leads to the release of harmful gases and contributes to the increase in global warming. However, natural food waste has several valuable industrial applications, and one such application is producing activated carbon, renowned for its superior adsorptive properties. Activated carbon made from natural food waste has been used for colour in natural dye treatment, mostly from textile industries. Colour fastness efficiency is critical, and in this aspect, activated carbon from natural food waste has shown significant improvements in natural colour fastness. Activated carbon can be produced from different biomass materials, which include coconut shells, sawdust, peat, rice husks, among others. However, natural food waste, including, banana peels, coconut shells, lemon woods, egg shells sea shells, and tea leaves, has been identified as a vital source for producing activated carbon. The application of natural food waste for activated carbon production has several advantages, including its abundance and an inexpensive method of acquisition. Additionally, the use of natural food waste for activated carbon production provides a sustainable approach to waste management, reducing the carbon footprint in the environment. This study demonstrated the This paper reports the studies available on the extraction of dyes from egg shells, finishing with two different natural fabrics bamboo and cotton fabric in different blending ratios and identifies the effects of different mordants and mordanting methods on the color shade. Egg shell-based activated carbon was successfully synthesized by the simple chemical activation process From an environmental point of view, replacing synthetic dyes with natural ones is not only a strategy to reduce risk and pollutants, but also an opportunity for new markets and jobs. this is necessitates newer research on application of natural dyes on different fabric for completely ecofriendly textiles .the fundamentals of naturals dyes chemistry and some of the important research work were therefore discussed in this article.

Keywords: Natural dyes, bamboo and cotton fabric, Egg shell, environment, colour fastness.

INTRODUCTION

Worldwide consumption of hen eggs is quite high, which results into availability of large amount of discarded egg wastes, particularly egg shell (ES) Disposal of ES is always a problem particularly to the authorities of food, bakery and poultry units. In recent years, attempts have been made to utilize ES and ESM for the production of biodiesel and collagen but results are not much economically viable.

Last 10 years have witnessed a systematic growth in the use of ES as adsorbents for the removal of variety of organic as well as inorganic hazardous chemicals, particularly from wastewater. Literature survey reveals that ES in their natural as well as chemically modified forms have provided excellent results for the removal of various classes of dyes, oxalic acid, phenol, pesticides, humic acid, pharmaceutics, surfactants, PAHs, heavy-, precious- and light- metals, actinides, fluorides, etc. In recent years powdered ESM have been modified to Nano-particles and used as adsorbent in various interesting applications. Reports are also available on the use of nanostructured material CHAP, derived from ES, for the removal of cadmium and lead ions from waste water.

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Eggshell activated carbon powder has drawn significant attention lately due to its potential in dye preparation. Eggshells are considered waste materials as most people tend to throw them away without realizing their numerous potential applications. Recent studies have shown that eggshell activated carbon powder is a viable and effective material for removing impurities from dyes during preparation.

One study carried out by B. Kumar et al. revealed that eggshell activated carbon powder's high porosity and surface area make it an efficient material for removing metal ions from dye effluents. The study demonstrated that eggshell activated carbon powder with a particle size of less than 500 µm could be used to significantly reduce toxic metal impurities such as arsenic, lead, and cadmium from dye preparations. Eggshell activated carbon powder's ability to remove metal ions from dye preparations means that it can be effectively used in textile industries to produce safe and high-quality dyed fabrics.

Another study conducted by Y. Gao et al. investigated the adsorption properties of eggshell activated carbon powder on methylene blue (MB) dye. The results demonstrated that the eggshell activated carbon powder synthesized from eggshell waste could highly adsorb MB dye. In addition, the study showed that the material demonstrated excellent reusability and could be a cost-effective adsorbent for the preparation of dyed fabrics.

DESCRIPTION

Dye production method using egg charcoal and dyeing method using the same Recently, with increasing interest in health, development of health-related products using natural materials such as loess is being actively performed. On the other hand, the charcoal that has been used to soak fuel and bowel is known to have functions such as anti-corruption, deodorizing effect, antibacterial, electromagnetic wave blocking, far-infrared emission.

Efforts have recently been made to scientifically prove the efficacy of the charcoal in relation to the use case of the char, and in addition to the anti-corruption and deodorizing function, the effects of anion release, moisture control, and harmful electromagnetic waves are newly revealed. Accordingly, as the awareness of charcoal and health care are increasing, the use of charcoal in real life is increasing, and related charcoal-related products are steadily being developed and commercialized.

Attempts have been made to dye charcoal powders on fabrics so that the efficacy of charcoal is related to the human body so that the charcoal can be used in direct contact with the human body. However, due to the nature of the composition of the charcoal intimacy with the cloth is weak, there is a problem that does not adhere well, it The present invention was devised to improve the above problems, and an object of the present invention is to provide a dye producing method using eggshell charcoal and dyeing method using the same, which is excellent in adhesion to fibers and can be uniformly dyed.

MATERIALS AND METHODS

The constructional parameters of the selected Fabrics – Hand Weaving process

The yarns were subjected to hand weaving process in such a way to get 100% plain fabric and blended fabrics in different ratio. The constructional parameter details are as follows. The constructional parameter of the Woven fabrics was 100% cotton, 100% bamboo and 60/40 bamboo/cotton blend, 40/60 bamboo/cotton, 50/50 bamboo/cotton. Warp and weft densities were measured according to (ASTM-standards using counting glass. Yarn linear density and fabric weight per unit area, i.e. grams per square meter were determined according to Fabric Weight (GSM) (ASTM). The fabric thickness was measured according to ASTM test method was used in the present study.

Selection of charcoal sources

The source of Charcoal was selected based on the eco-friendly property. As the egg shell ash were considered as waste and disposed either as for land filling or for incineration, these waste were considered to be the source of materials for the preparation of charcoal in the present study.

Preparation of charcoal –Egg shell ash

The source of Charcoal was selected based on the eco-friendly property. As the egg shell ash were considered as waste and disposed either as for land filling or for incineration, these waste were considered to be the source of materials for the preparation of charcoal in the present study.

Fabric Pretreatment and finishing fabrics with prepared charcoal

The dye production method using the egg charcoal and the dyeing method using the same according to a preferred embodiment of the present invention a dying process according to a preferred embodiment of the present invention.First,

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egg shell charcoal can be produced by the normal carbonization process ones. Preferably, dried raw egg shells is placed in a carbonization furnace, and carbonization treatment is performed at a low temperature of 1000 ° C. while adjusting the amount of inlet air so that a small amount of air is introduced into the carbonization furnace so that the Egg shells is carbonized at a low temperature. Water is sprayed on the carbonized egg shells to produce egg charcoal.

Next, egg charcoal is immersed in water for a predetermined first period. Preferably, it is a type the egg shell charcoal-immersed solution, which has been immersed in the first period, is first pulverized with a grinder The milled egg shell charcoal dipped solution is again immersed in a jar for a second predetermined time. Preferably, the second period is applied to about one month. The eggshell charcoal dipped solution, which has been immersed for about one month, is subjected to the second pulverization process again with a grinder such as a mixer. Particle size of the secondary milled eggshell charcoal is preferably formed to such an extent that it can be dispersed and fixed evenly to the fabric, for example, several tens of micrometers or less.

The salt is added to the solution in which the secondary charcoal-treated egg shells charcoal is immersed in a predetermined ratio and heated. The heating process is carried out to dry fry, method with open bowl the state heated to about 100 ℃ 20 minutes to 30 minutes. At this time, the salt is added to the egg charcoal dye generated through the heating process to increase the sharpness of the color when the color is colored on the bamboo fabrics, and to enhance the adhesion to the fabric. This heating process produces a liquid dye using eggshell charcoal. In the dyeing process with a liquid dye, first, the dyeing object is colored with the dye solution generated through heating. Preferably, the coloring step is rubbed by hand in the state of immersing a dyeing object, such as a cloth in the dye solution to allow the dye solution to penetrate and color the cloth evenly. The colored fabric is then dried in humid shades. The coloration process by dipping and drying is performed at least 5 times or more preferably about 9 times.

The fabric, after which the coloring process is completed, is then subjected to the usual mordant treatment. As a mordant, what is necessary is just to apply suitably according to the cloth material to which various well-known materials are applied.

Clothing produced through this process provides the efficacy of egg shell charcoal..

Method of testing Color fastness to Rubbing

Principle
This test is designed to determine the degree of color which may be transferred from the surface of a colored fabric to a specific test cloth for rubbing (dry + wet).

Equipment

- Crock meter, Cotton rubbing cotton, Grey scale, Stop watch & Color matching cabinet

Size of fabric
5×5 cm two pieces of sample (one warp direction/wale direction & another weft/course direction).
Test procedure

- Lock the test specimen onto the base of the crock meter.
- Using the spinal spring clip, set 5cm5cm of the white cotton fabric to the finger of the crock meter.
- Lower the covered finger on the test sample.
- Turn hand crank at the rate of one turn per second (1010 sec).
- Remove the white rubbing test cloth and evaluate with grey scale.

Evaluation
Evaluation the contrast between the treated and untreated white rubbing cloth with grey scale and rated 1-5.

Method of testing Color fastness to wash
Color fastness to wash is very important for lab-dip. There are varieties of testing procedure, because-

- The methods depend on the use of dyed goods.

The degree of fading and staining of dyed goods for washing depends upon the following factors:

- Temperature range may be from 40°C-95°C.
- The type and amount of detergent added to the washing bath. In many testing procedure a standard detergent is used. The washing liquor to goods ratio is 50:01.

Principle of wash fastness

A specimen (lab-dip) in contact with specified adjacent fabric or fabric or fabric is laundered, rinsed and dried. The

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specimen/composite sample is treated under appropriate condition in a chemical bath for short time. The abrasive action is accomplished by the use of a liquor ratio and an appropriate number of steel balls. The change in color of the specimen (dyed sample) and the staining of the adjacent fabric is assessed by recommended Grey scale (1to 5) .

Apparatus and materials

- Wash –wheel with a thermostatically controlled water bath and rating speed of (40±2) rpm.
- Stainless steel container (capacity 50±45 ml)
- Stainless steel ball (dia = 0.6cm, weight = 1 gm) SDC, Multifibre fabric (bamboo and cotton)
- Thermometer, Sewing machine, Dryer, Color matching cabinet and ISO Grey Scales.

Reagents

- Sodium perborate ($NaBo_2.H_2O.3H_2O$)
- ECE without brightening agent & Distilled water

Test specimen

Test specimen cut a sample of dyed goods 10to 5cm and sew it with same size multifibre fabric. This is the composite test sample.

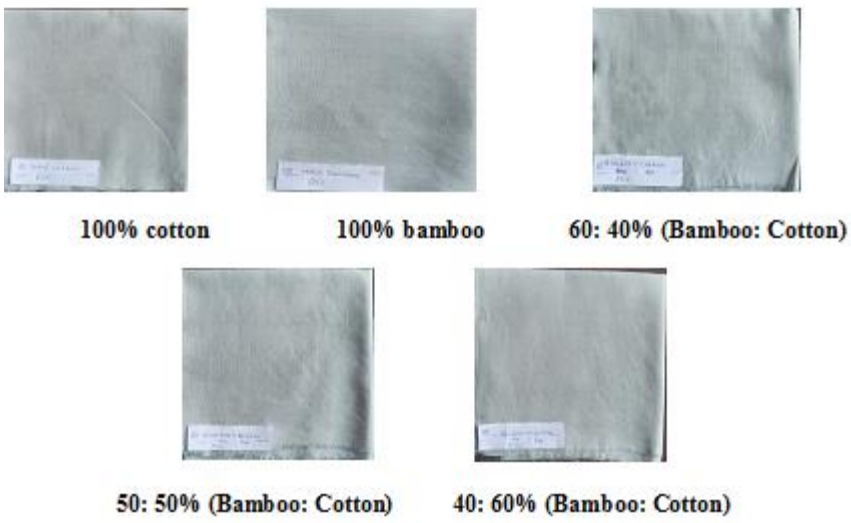
Evaluation of wash fastness

Compare the contrast between the treated and untreated sample with Grey Scale for changing color of dyed sample and staining of adjacent fabric in a color matching cabinet. Numerical rating for color changing is the shade and staining to adjacent fabric. Number of method used.

Assessment of color fastness

Table 1. Grey Scale

Grey scale	
Numerical rating	For wash and rubbibg
1	Poor/little
2	moderate
3	average
4	Good
5	excellent



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Result according this grey scale

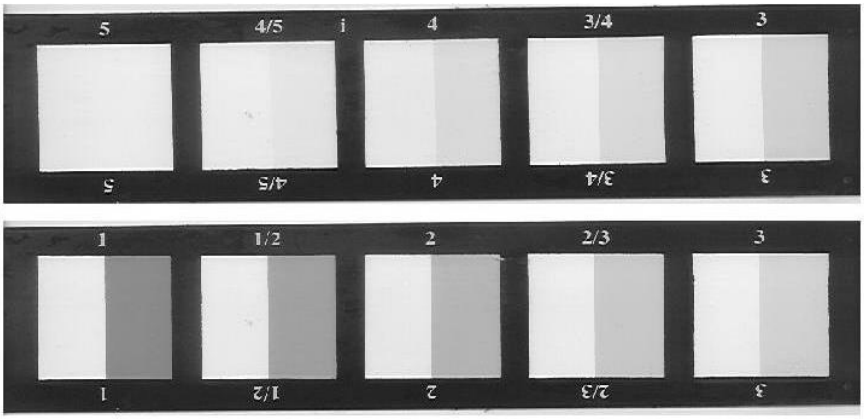

Fig.2

Method of testing Color fastness to Rubbing

Principle

This test is designed to determine the degree of color which may be transferred from the surface of a colored fabric to a specific test cloth for rubbing (dry + wet).

Equipment

- Crock meter, Cotton rubbing cotton, Grey scale, Stop watch & Color matching cabinet

Size of fabric

4×5 cm two pieces of sample (one warp direction/wale direction & another weft/course direction).

Test procedure

Lock the test specimen onto the base of the crock meter. Using the spinal spring clip, set 5cm5cm of the white cotton fabric to the finger of the crock meter. Lower the covered finger on the test sample. Turn hand crank at the rate of one turn per second (1010 sec).Remove the white rubbing test cloth and evaluate with grey scale.

Evaluation

Evaluation the contrast between the treated and untreated white rubbing cloth with grey scale and rated 1-5.

Method of testing Color fastness to wash

Color fastness to wash is very important for lab-dip. There are varieties of testing procedure, because-

- The methods depend on the use of dyed goods.
- The degree of fading and staining of dyed goods for washing depends upon the following factors:
- Temperature range may be from 40°C-95°C.

The type and amount of detergent added to the washing bath. In many testing procedure a standard detergent is used. The washing liquor to goods ratio is 50:01.

Principle of wash fastness

A specimen (lab-dip) in contact with specified adjacent fabric or fabric or fabric is laundered, rinsed and dried. The specimen/composite sample is treated under appropriate condition in a chemical bath for short time. The abrasive action

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is accomplished by the use of a liquor ratio and an appropriate number of steel balls. The change in color of the specimen (dyed sample) and the staining of the adjacent fabric is assessed by recommended Grey scale (1-5)

Test specimen

Test specimen cut a sample of dyed goods 10*4cm and sew it with same size multifibre fabric. This is the composite test sample.

Evaluation of wash fastness

Compare the contrast between the treated and untreated sample with Grey Scale for changing color of dyed sample and staining of adjacent fabric in a color matching cabinet. Numerical rating for color changing is the shade and staining to adjacent fabric. Number of method used.

Assessment of color fastness

Result And Discussion-Color fastness to Dry Rubbing

Noof sample	Sample name	Gray scale range
1	100% Bamboo	2/3
2	100% cotton	4/5
3	60:40 % B:C	3/4
4	40:60 % B:C	4
5	50:50 % B:C	3

We have seen actual amount of salt dyed sample was proper shade, less amount of salt give light and high amount of salt give deep shade. We have also seen color fastness to Rubbing test result give all sample approximately same. So we can say salt amount do not influence fastness property.

Color fastness to Wet Rubbing

No of sample	Sample name	Gray scale range
1	100% Bamboo	3
2	100% cotton	2/3
3	60:40 % B:C	4/5
4	40:60 % B:C	3
5	50:50 % B:C	2

We have seen actual amount of salt dyed sample was proper shade, less amount of salt give light and high amount of salt give deep shade. We have also seen color fastness to Rubbing test result give all sample approximately same. So we can say salt amount do not influence fastness property.

No of sample	Sample name	Gray scale range
1	100% Bamboo	3/2
2	100% cotton	3
3	60:40 % B:C	2
4	40:60 % B:C	3
5	50:50 % B:C	3/4

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Color fastness to wash

No of sample	Sample name	Gray scale range
1	100% Bamboo	3
2	100% cotton	4/5
3	60:40 % B:C	2
4	40:60 % B:C	3
5	50:50 % B:C	3

No of sample	Sample name	Gray scale range
1	100% Bamboo	4
2	100% cotton	2
3	60:40 % B:C	3
4	40:60 % B:C	3
5	50:50 % B:C	2/3

we have seen actual amount of salt dyed sample was proper shade, less amount of salt give light and high amount of salt give deep shade. We have also seen color fastness to Wash test result give all sample approximately same. So we can say salt amount do not influence fastness property.

Advantages

In present scenario environmental consciousness of people about natural products, renewable nature of materials, less environmental damage and sustainability of the natural products has further revived the use of natural dyes in dyeing of textile materials

Natural dyes are having some inherent advantages

- No health hazard
- Easy extraction and purification
- No effluent generation
- Very highly sustainability
- Mild dyeing conditions

CONCLUSION

The activated charcoal from egg shell ash was used to finish the cotton and bamboo fabric. Absorbency test revealed that nativity of the fabrics remain unchanged even after finished with charcoal and ash. Colour fastness showed average grade values which shall be improved after standard optimization techniques. The pretreatment, is applied through pad-dry-cure process, brings about some salt change in the treated fabric. Fastness properties are adequate and quite comparable with conventionally dyed samples. The rubbing fastness of the dyed fabric change slightly. When dyeing the modified substrates, reactive Dyes can be much more efficiently exhausted and fixed onto Cellulosic fabric under neutral condition in the variation of Salt concentration. The modified Dyeing don't suffer either from a significant drop in wash fastness and perspiration fastness. There has significant effect on dyed fabric appearance and quality for the variation use of different concentration of salt with reactive dyes. That was showed good all fastness properties for different types of structural fabric on salt concentration. Review contains future prospects and challenges associated with egg waste materials. Natural dye does not have any shade card to match the samples or reproducing the shade. So there is need of collection of spectral data of natural dyes so that any shade can be reproduced. There is need of awareness about natural dyes dyed fabric in people so that it can be popular in big way and due to that demand and consumption of natural dyed fabric will increase. In conclusion, eggshell activated carbon powder is a promising and sustainable material for removing impurities during dye preparation and also good natural dye colour fastness. Its abundant availability and relatively low cost compared to traditional adsorbents such as activated carbon make it an attractive option for textile industries looking to produce high-quality, safe, and sustainable dyed fabrics.

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