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Regenerated Bamboo Fibres Added with Peppermint Extract

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Abstract: Bamboo textiles include bamboo yarn, fabric, and apparel. New technologies allow bamboo fibre to be utilised in textile and fashion applications other than bustles and corset ribs. This study produces regenerated bamboo fibres with peppermint extract and investigates their chemical characteristics. For cuprammonium rayon, this experiment uses bamboo, peppermints, ammonia, basic copper carbonate, and sulfuric acid. First-time lab experiments was not successfully to obtained in testing Schweizer's reagent using peppermint powder. The first testing with sulfuric acid failed because there were too many peppermints in the solvent, but the second test with the right formula produced excellent rayon silk bamboo.

Keywords: Rayon, Bamboo Textiles, Peppermint

1. Introduction

Bamboo textiles are made from bamboo fibres. New technology has allowed bamboo fibre to be used for textile and fashion purposes such as shirts, pants, socks, sheets and pillowcases. Bamboo yarn can be used with hemp or spandex for a distinctive design. Bamboo is a fast-growing, plastic-free alternative. Modern bamboo clothing uses viscose rayon, by dissolveings bamboo cellulose and extrudes into fibres. This process produces bamboo fibres called rayon.

Bamboo viscose has environmental advantages over wood pulp-derived viscose. Bamboo crops can be grown on marginal land. In certain circumstances, bamboo has caused forest damage. However, China's 1990s forestry policy revisions have reduced this. Viscose processing produces carbon disulfide, like wood-pulp viscose processing. Bamboo cellulose can gather all solvents in a closed-loop viscose process [1].

Asia uses bamboo to manufacture paper, swords, and household goods. Bamboo fabrics were initially sold commercially in the early 2000s, however the concept is old. This invention has been tested and refined for over a century [2]. Philipp Lichtenstadt filed the first US bamboo patent in 1864.

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He wanted to create a "novel and effective process for dissolving bamboo fibre so that it may be exploited in the creation of cordage, textiles, mats, or pulp for paper." The concept failed because of poor bamboo demand and high Asian shipping expenses.

Bamboo fibre offers unique and naturally anti-bacterial, bacteriostasis, and deodorization properties. The Japan Textile Inspection Association has confirmed that, even after fifty washings, bamboo fibre fabric has outstanding anti-bacterial and bacteriostasis properties [3].

During exercise, the human body creates heat which can lead to heat exhaustion if the cooling process happens very slowly. To avoid minor or major damage to the human body, a mixture of bamboo and peppermint to make rayon is produced by using cuprammonium methods. Bamboo and peppermint have a cooling property which can fasten the cooling process of the body after exercising. The ability of the mixture to produce fibres was studied. The chemical properties of the produced fibres was also investigate.

2. Materials and Methods

The materials used, solvent preparation, wet spinning process and method of testing conducted on the fibres are explained.

2.1 Materials

The material used in this study for making cuprammonium methods are bamboo fibre, peppermint powder, basic copper carbonate, and ammonia solution. Sulfuric acid is for hardening the rayon solvent.

The bamboo fibre were cut into small size approximately 0.5 mm. Peppermint powder was supplied by Blossom de Art Craft Academy and copper carbonate copper carbonate is from Bendosen. The ammonia solution used is from HmbG Chemicals with 25% concentrated and sulfuric acid acid also from HmbG Chemicals with 98% concentration.

2.2 Methods

Viscose-peppermint solution was produced by mixing 40 ml ammonia solution into 4 g copper carbonate. The solution forming a complex compound of copper with is cupric ammonium carbonate. The solution was poured into the other beaker for the solution to become clear. This is because not all the copper is dissolved. Moreover, taking about 0.6 grams of the small bamboo piece and begin to add it slowly to the copper complex solution then put the peppermints powder after that. Then put 230 mg peppermints in 5%, 330 mg peppermints in 10%, 430 mg peppermints in 15%, and 530 mg peppermints in 20% into the rayon peppermints solution. Then the artificial silk is made from bamboo viscose, which is very soluble. By used 1 molar solution that got 27.17ml sulfuric acid then pour into a beaker. After that, fill the syringe with 30 ml of viscose, insert the needle, and slowly inject it into the acid solution. With that form a viscose polymerizes cellulose from sulfuric acid. Next, the sulfuric acid dissolves copper complexes [4]. Rayon fibres are thin blue. Sulfuric acid combines with the complex compound to wash copper salts from the fibres over time.

3. Results and Discussion

The production of the fibre is unsuccessful for the first time because the solvent not viscose enough The composition of the materials was revised as shown in Table 1 until fibres successfully produce. The success rayon solution after second time making the solvent with correct formula and right amount of copper carbonate($CH_2Cu_2O_5$) plus ammonia (NH_3) plus with bamboo fibre and peppermint powder.

Table 1 Formula of peppermint in the solvent

Copper carbonate (mg)	Ammonia(ml)	Bamboo (mg)	Peppermint (mg)
4	40	0.6	230
4	40	0.6	330
4	40	0.6	430
4	40	0.6	530

3.1 Results

Data result in Table 2 shows, 10% and 15% of solution have the higher content peppermints in this solvent from 5% and 20% batch. As for bamboo content again the 15% of solution is the higher one from solution 5%, 10%, and 20%. The 20% of solvent was the worst one because has the least peppermint and bamboo fibre from 5%, 10%, and 15% of solvent. This is because too much peppermint content in the solvent that made the fibre is failed to form a nice rayon silk.

The IR spectrogram comparison reveals that all the fibres under investigation were created from regenerated cellulose. The variable proportion of peppermint in the fibres after their previous processing may cause minor alterations in the strength of the distinctive absorption bands and their small repositioning. The spectra of "bamboo fibres" contain peaks between 895 and 1370 cm^{-1} that are typical for regenerated cellulose. The scissoring vibrations of groups C-H, and O-H, which are typical for cellulose, were found to have peaks with wavelength values in the range 1200-1400 cm^{-1}.

Table 2 Characteristic wavenumber values for cellulose as a pattern compared with the fibres investigated

Polymer	Regenerated Cellulose	Control group	Peppermints 5%	Peppermints 10%	Peppermints 15%	Peppermints 20%
Wavenumber cm^{-1}	1635	1638.2	1638.2	1638.2	1636.3	1636.3
	1370	1366.1	1364.2	1364.2	1362.3	-
	1160	1157.3	1157.3	1157.3	1157.3	1157.3
	1070	1045.5	1047.4	1045.5	1045.5	1049.2
	1000	997.1	-	-	997.1	-
	900	-	894.6	894.6	-	-
	700	-	-	665.3	-	-

3.2 Discussions for rayon

From the process of creating the fibre, there are numerous issues that arise, each of which has its own unique set of challenges. This is due to the fact that rayon involves an excessive number of peppermints and other ingredients. In addition, fibres are brittle and easy to tear apart showing no strength in the fibres produced. Since the fibre cannot be successfully manufactured the process of cuprammonium rayon method might not be suitable for peppermint powder. Based on the observations made in preparation for this experiment, the control group was given fibre that was significantly

stronger than the other fibre combined with peppermint powder. This is because the control group has a strong bond within the solvent from the peppermint solvent.

3.3 Figures of FTIR

To investigate the chemical properties of the blended fibres, the FTIR testing was conducted. The testing done is to investigate the composition of each material in the fibre as shown in Figure 1 to Figure 6.

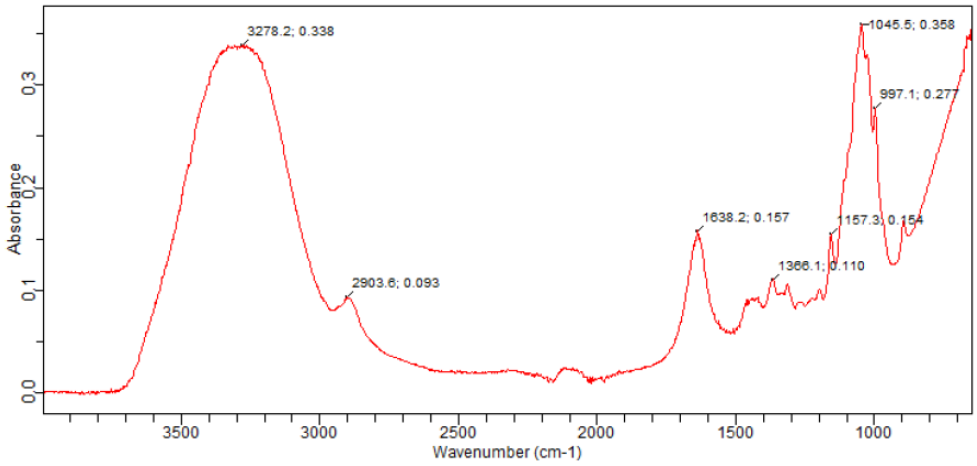

Figure 1. Graph fibre than not has peppermint for this testing

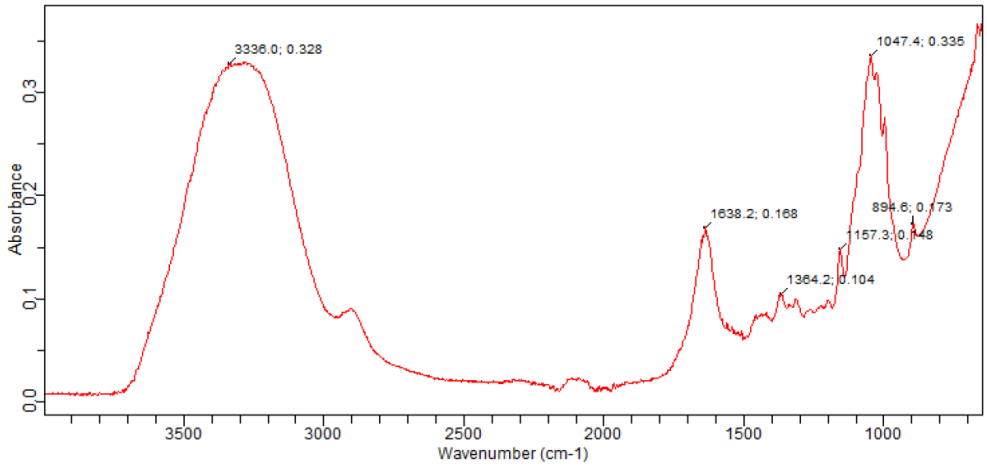

Figure 2. Graph for peppermints 5% in the rayon fibre

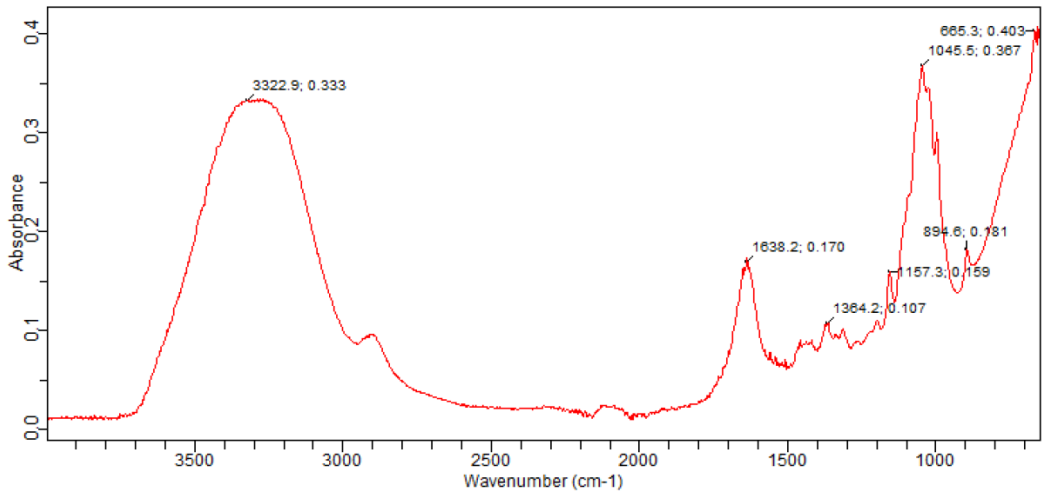

Figure 3. Graph for peppermints 10% in the rayon fibre

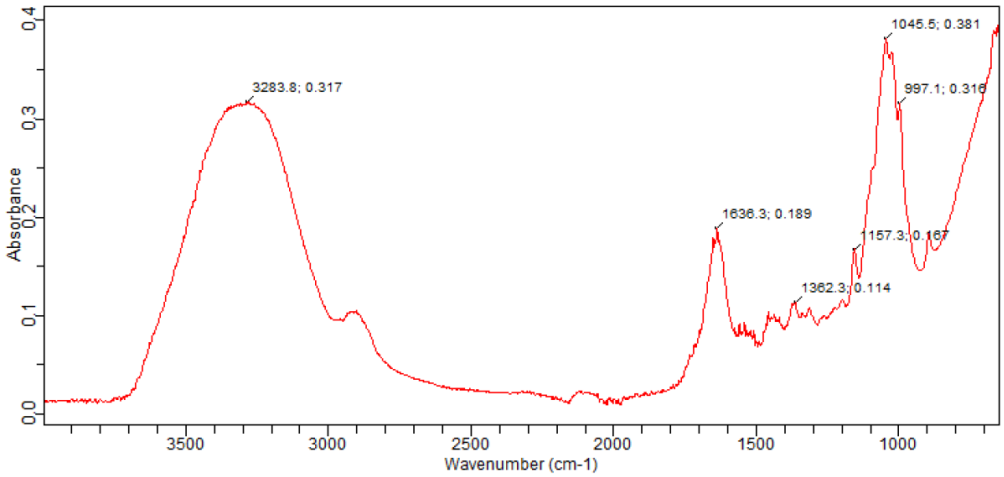

Figure 4. Graph for peppermints 15% in the rayon fibre

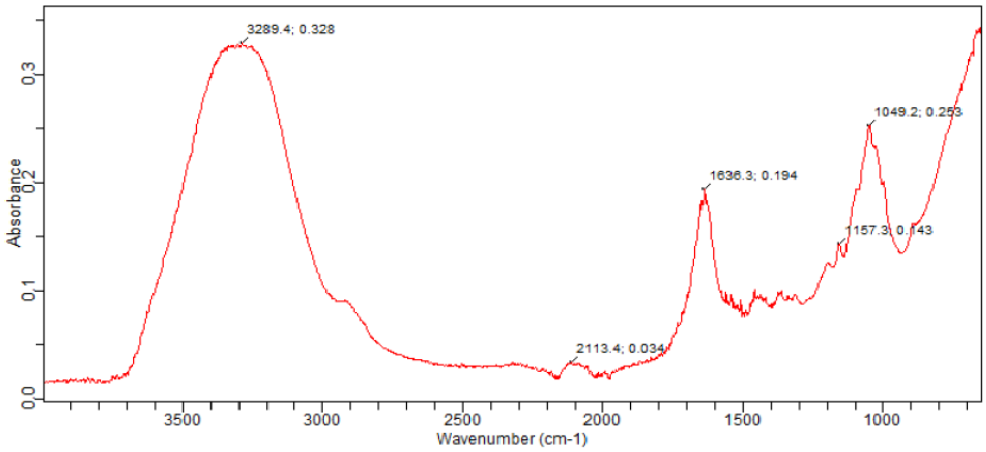

Figure 5. Graph for peppermints 20% in the rayon fibre

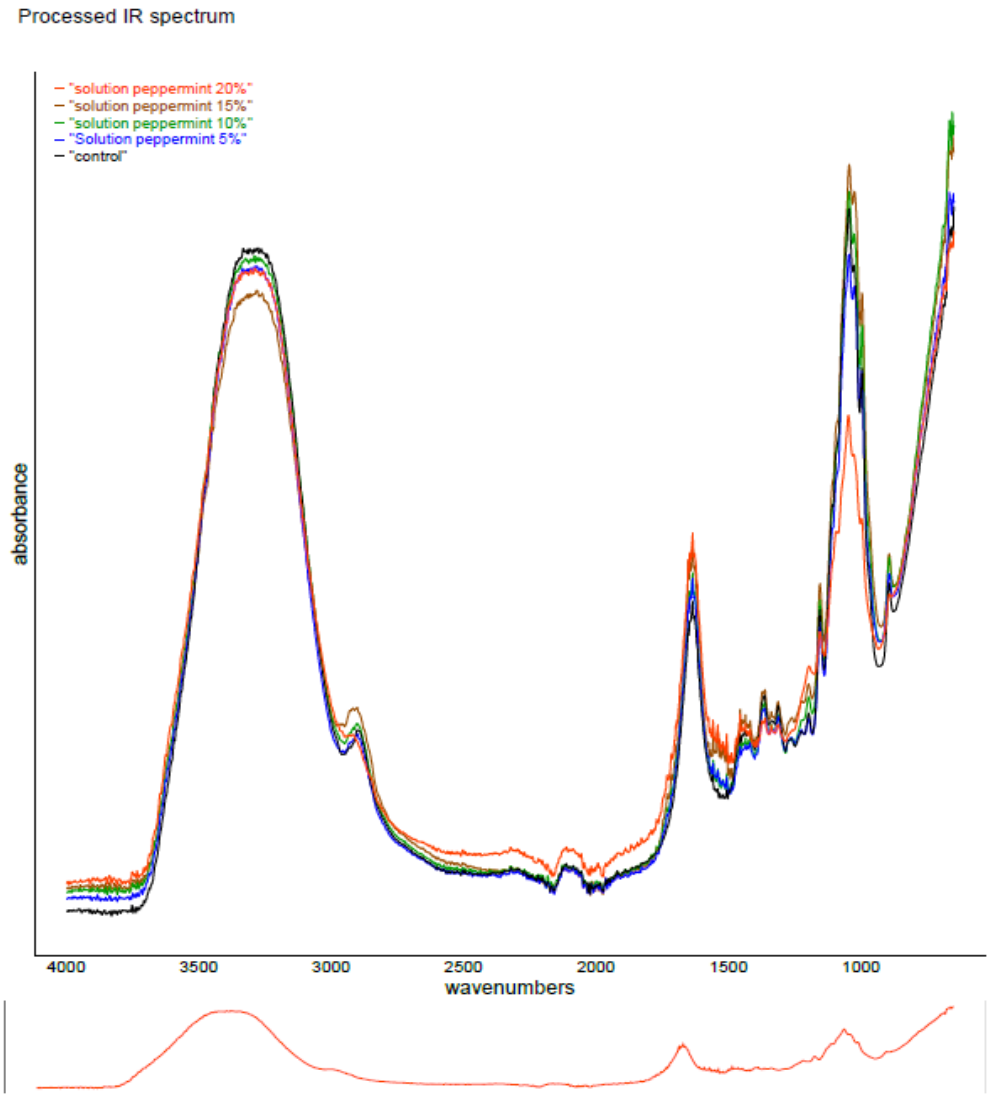

Figure 6. Graph overall for FTIR

4. Conclusion

In conclusion. The laboratory experiment using peppermint powder and Schweizer's reagent was not successfully obtained. The first sulfuric acid bathing failed because the solvent included too many peppermints. Peppermint proportions differ from control unit fibres. The FTIR graph displays the acid 0-H group. The graph has sulfuric acid. Manufacturing turns bamboo fibre into rayon silk. Since the fibre breaks easily, it doesn't work with peppermint. This hinders the combination.

As for recommendation, the difficulty that arises is that the fibre is prone to coming apart when it is pulled. Regarding the advice, this issue may be circumvented by extending the amount of time required for the solvent rayon to mix together the various chemical components, such as ammonia, copper carbonate, bamboo fibre, and sulfuric acid. Aside from that, it is suggested to utilise a different approach from this cuprammonium rayon to the method of processing rayon known as wet spinning due to the fact that this method is not appropriate for peppermint powder. In addition, ensure that the rayon silk has through the appropriate drying process so that it may be easily stretched to form fabric.

Acknowledgement

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