The Improvement Of Carbon Black From Waste Tires For Offset Printing Ink Using Coupling Agent

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Abstract

This work was aimed to improve the carbon black from waste tires for printing ink using coupling agent to disperse carbon black particle for making an oil-based offset ink. This experiment used 2 coupling agent, these were silane coupling and derivative fatty acid and used to produce offset inks for the 7 formulas. Formula 1 Commercail carbon black,Formula 2 carbon black was not washed by Nitric acid, formula 3 carbon black was not washed by Nitric acid and was added silane coupling agent, formula 4 carbon black was not washed by Nitric acid and was added fatty acid modified emulsifier , formula 5 carbon black was washed by nitric acid, formula 6 carbon black was washed by nitric acid and was added silane coupling, formula 7 carbon black was washed by nitric acid and was added fatty acid modified emulsifier. Bring all 6 formulas to test property to compare with offset ink commercial. First find the smallest particle of carbon black for 90 minutes. It was found that formula 4 took 20 minutes to make particles 12 micron and it is smalles particle of all. Then measured ink flow by Spread-O-Meter and measured diameter after 1 minute. It was found that formula 3 and 3 were 77 mm. and approximate commercial ink. Then measured tack of ink with Ink-O-Meter, it was found that formula 2, 3, 4, 6 and 7 were 2.4 and formula 5 was 2. Then measured viscosity and yield value of ink by Lary viscometer. It was found that formula 2 had 77 poise of ink viscosity and 670 dyne.s/cm^2 of ink yield value that was approximate commercial ink. Finally measured Emulsification capacity (%) by Kershaw Water Pick up Tester. It was found that formula 6 had 74% and it was approximate commercial ink.

Key words: Carbon black from waste tires, Coupling agent, Offset ink

1. Introduction

Waste tire make problems about landfill and annihilation. The removal of waste made by pyrolysis which a better way than the others and tend to develop as fuel in terms of commercial.

Disadventages of pyrolisis tire was the solid waste that was carbon black which called “Char” which is difficult to remove. So this work has to reduce waste from pyrolisis tire to support renewable energy and environmental industries by apply carbon black to produce black ink in off-set printing.

This work was compared properties of commercial ink and ink from carbon black which mixed coupling agent to develop the quality of carbon black in the commercial production

2. Materials and Methods

2.1 Preparation of Carbon black

2.1.1 Carbon black wasted from pyrolysis process was cleaned by nitric acid 20 %(by mass) for 1 hour at 80 ◦c

2.1.2 The cleaned carbon black was analyzed elements before and after cleaning by nitric acid using X-Ray Florescence method

2.2 Preparation of the offset ink

2.2.1 Making a commercial web-offset ink (standard formula) and mixing carbon black from tire for 6 formulas

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Commercail carbon black	17

Table1. Ink formula 1

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (not washed by Nitric acid)	25

Table2. Ink formula 2

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (not washed by Nitric acid)	25
Silanes coupling agent	0.5

Table3. Ink formula 3

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (not washed by Nitric acid)	25
Derivative fatty acid	0.5

Table4. Ink formula 4

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (washed by Nitric acid)	25

Table5. Ink formula 5

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (washed by Nitric acid)	25
Silanes coupling agent	0.5

Table6. Ink formula 6

Ingredient	%
Phenolic resin	9
Gilsonite	7
Mineral oil	25
Calium carbonates	10
Extender powdre	0.5
Carbon black from tire (washed by Nitric acid)	25
Derivative fatty acid	0.5

Table7. Ink formula 7

2.2.2 Grinding the inks by a three roll mill Model S-2X6

2.2.3 Adding others ingredients: mineral oil 20%, Polyetylene wax 2% and Alkyd resin 3% in formula 1 and add mineral oil 17%, Polyetylene wax 2% and Alkyd resin 3% in formula 2-7

2.3 Test property of ink before printing

2.3.1 Ink flow (mm) by Spread-O-Meter Diameter, after 1 minute of operation at 25°c ±2

2.3.2 Tack by Ink-O-Meter, After 1 min of operation at 30°c ±2

2.3.3 Viscosity (Poise) by Laray Viscosity at a weight range of 1000, 800, 600, 400 and 200g

2.3.4 Yield Value (Dyne.s/cm^2) using Laray Viscosity at a weight range of 1000, 800, 600, 400 and 200g

2.3.5 % Emulsification Capacity by Kershaw water pick up tester

3 Results and discussion

3.1 Quanties of elements of wasted carbon black

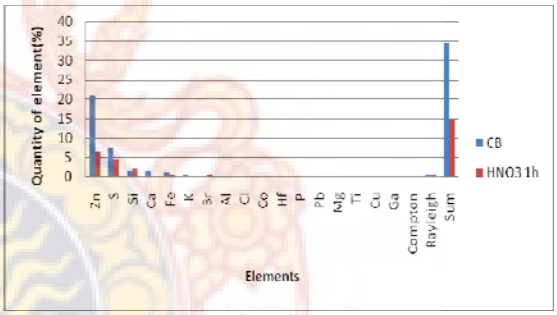

Fig.1. Elements by X-Ray Florescence of wasted carbon black from tired before and after washing by nitric acid.

When took carbon black was washed by nitric acid. It was found the quantity of element in carbon black was lowered

3.2 Particle size of pigment per grinding time

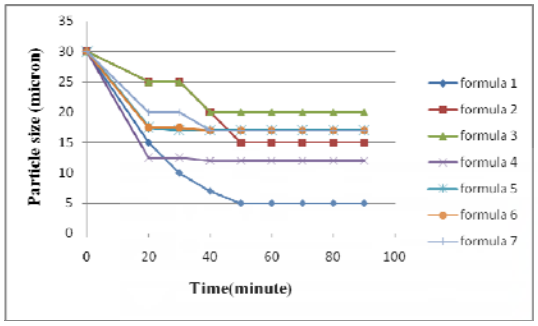

Fig.2. Reduction of particle size of pigment per grinding time

It was found that formula 4 took 20 minutes to make particles 12 micron

3.3 Tack

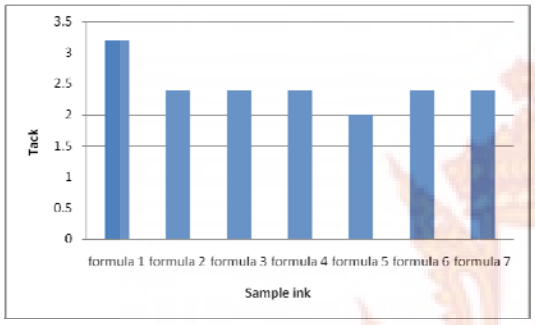

Fig.3. Show tack value of inks

It was found that tack value of formula 2, 3, 4, 6 and 7 were 2.4 and formula 5 was 2 which the values was lower than tack of formula 1 (commercial ink).

3.4 Flow

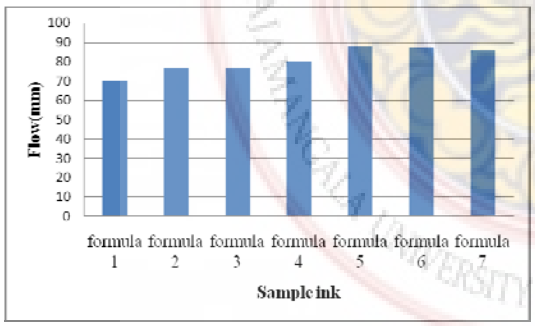

Fig.4. Flow values of inks

It was found that formula 3 and 3 were 77 mm. and approximate commercial ink.

3.5 Viscosity

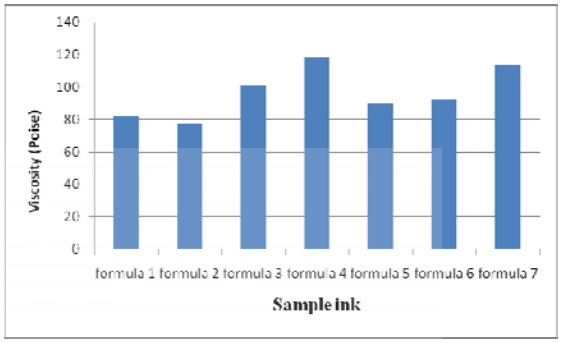

Fig.5. viscosity of inks

3.6 Yield Value

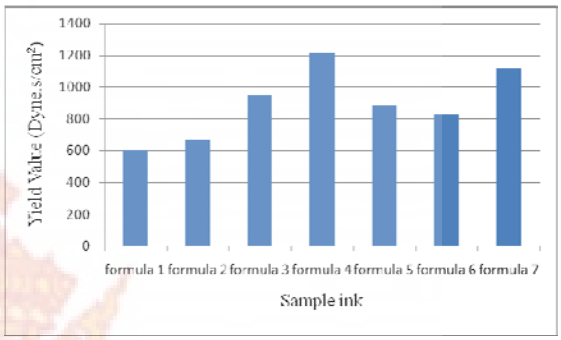

Fig.6. yield value of inks

It was found that formula 2 had 77 poise of ink viscosity and 670 dyne.s/cm^2 of ink yield value that was approximate commercial ink.

3.7 % Emulsification Capacity

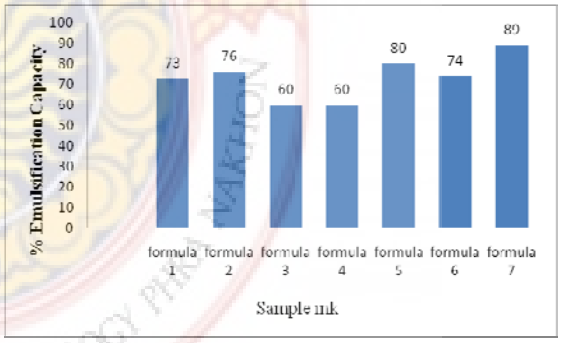

Fig.7. % Emulsification Capacity of ink

It was found that formula 6 had 74% and it was approximate commercial ink.

4. Conclusions

The offset Ink made from pyrolysis carbon black had different quality when compared to the commercial web offset

ink. The further research is study of print quality on paper and the improvement of the ink formula.

5. Acknowledgements

The authors gratefully acknowledge the Thailand Research Fund, King Mongkut's University of Technology Thonburi and Inter Ink Company Limited for research support.

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