

Vat Dye Experiment

September 26th, 2016

Samantha Strandberg

Abstract:

If one would not soak textiles in water before vat dyeing the textiles in indigo then it will affect the affinity if the time is fixed. The soaked textiles had a higher saturation of color than the dry textiles did. Absorption of the soluble reduced dye by the fibers is due to the hydrogen bonding between dye molecules and fiber molecules and ionic bonding between the dye molecules and fiber molecules. One can conclude that there is a stronger affinity to soaked textiles compared to dry textiles due to hydrogen bonding.

Introduction:

The purpose of the experiment is to discover if one would not soak textiles in water before vat dyeing the textiles in indigo, then would it affect the affinity if the time is fixed.

The affinity of a dye on a textile depends on the chemical structure of the dye being used; indigo ($C_{16}H_{10}N_2O_2$) along with the textile molecule and the interaction between them.

Certain fibers are drawn to water molecules due to hydrogen bonding and ionic bonding. When the textiles are immersed in water, the fibers become ajar. At this

time, this allows a water soluble dye (indigo) to penetrate into the fibers smoothly within the dye bath.

Apparatus:

- Safety Glasses
- Rubber Gloves
- Plastic Apron
- Measuring Containers
- Digital Scales
- Digital pH meters
- Glass Beakers
- Permanent Black ink Pens
- Fabric Samples (Two swatches of each type)
 1. Cotton
 2. Silk
 3. Wool
 4. Linen
 5. Bamboo
 6. Rayon
 7. Jute
 8. Nylon
 9. Polyester
 10. 64% Nylon, 32% Polyester, 4% Spandex

- Indigo Dye
- Soda Ash-a reducing agent
- Thiox-a reducing agent
- Tubs
- Stirring Rods
- Wooden Clothespins
- Drying Racks
- Newspaper
- Water- 90 degrees Celsius

Procedures:

Creating Dye Bath:

Filled tub with tepid water. Added the dye, stirred gradually. Filled beaker with scorching water, poured reducing agent while stirring until dissolved. Added beaker to tub. Stirred gradually clockwise then counterclockwise, after well blended placed lid on the tub. Had dye bath sit for 60 minutes. Measured pH using digital meter. Made sure the liquid of the dye bath is yellowish green, not the bloom.



Dying Sequence:

Soaked textiles of set one for 30 minutes, rung them out. Removed bloom with gloves on. Placed set one of textiles into the dye vat. Left bottom of the vat residue alone.

Still with gloves on, rung out excessive dye from textiles below surface of vat. Removed set one. Had oxidization occur to obtain a stable color. Rinsed efficiently. Laid on newspaper.

Did not soak set two of textiles. The textiles were dry when placed into vat dye and from thenceforth on followed the sequence as set one.

Saving Vat Dye:

Put back the bloom in vat, stirred gradually. Placed lid on vat. Reused dye bath. Disposed by draining the bath down the sink. Clean materials with soap and water.


Determining HSB and RGB:

Took dyed swatches and compared it to the HSB/RGB chart at

Results/ Data:

Data Table for Wet Textiles:

soaked/wet



**CHEMISTRY AND ART:
TEXTILES AND DYES**

LABORATORY EXERCISE #1: VAT DYE

TEXTILE	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10
1 hr.										
DYE TYPE	Cotton	Silk	wool	linen	Bamboo	Rayon	Jute	Nylon	polyester	Nylon poly spandex
HUE (DEGREES) (1-359)	209	268	228	199	205	221	216	232	180	195
SATURATION(% (1-99)	13%	11%	32%	13%	17%	32%	32%	26%	11%	9%
BRIGHTNESS (%) (1-99)	25%	27%	13%	30%	29%	11%	20%	20%	48%	35%
RED (1-254)	55	68	23	67	61	19	35	38	109	81
GREEN (1-254)	64	61	27	80	76	25	48	41	136	93
BLUE (1-254)	72	76	44	86	87	37	67	64	136	97

AVG. Saturation 19.0%

Data Table for Dry Textiles:

CHEMISTRY AND ART:
TEXTILES AND DYES

LABORATORY EXERCISE #1: VAT DYE








Dry

TEXTILE NO ^{soak} time	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10
DYE TYPE	Cotton	Silk	wool	linen	Bamboo	Rayon	Jute	Nylon	polyester	Nylon poly spandex
HUE (DEGREES) (1-359)	195	216	216	211	199	199	206	188	171	194
SATURATION(%) (1-99)	1%	26%	20%	8%	12%	36%	22%	22%	13%	9%
BRIGHTNESS (%) (1-99)	35%	21%	21%	38%	38%	38%	18%	33%	61%	47%
RED (1-254)	88	40	43	89	85	62	36	66	160	109
GREEN (1-254)	90	51	51	97	101	110	47	98	182	126
BLUE (1-254)	90	67	64	105	109	132	57	103	179	131

Avg. of 16.

Sam S.

Soaked - Set 1

1. 100% COTTON 	2. 100% SILK 	3. 100% 
4. 100% LINEN 	5. 100% BAMBOO 	6. 100% RAYON 
7. 100% JUTE 	8. 100% NYLON 	9. 100% POLYESTER 
10. 64% NYLON/32% POLYESTER/4% SPANDEX 		

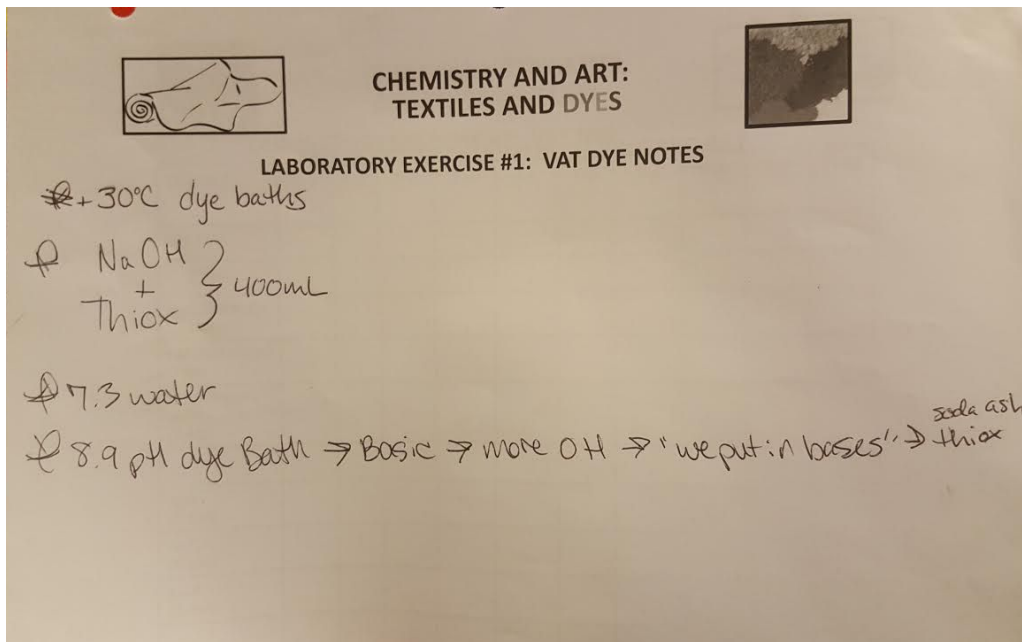
DYE TYPE:

Color Swatches from Soaked Textiles:

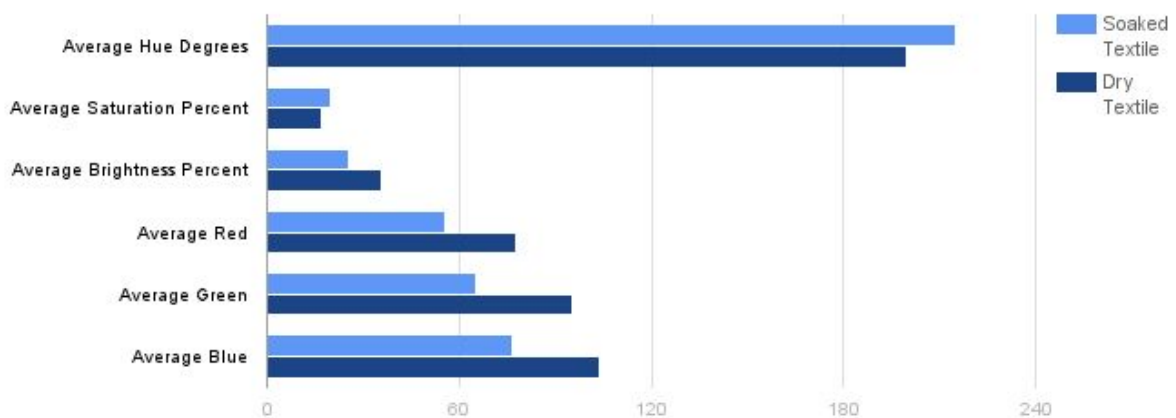
Color Swatches from Dry Textiles:



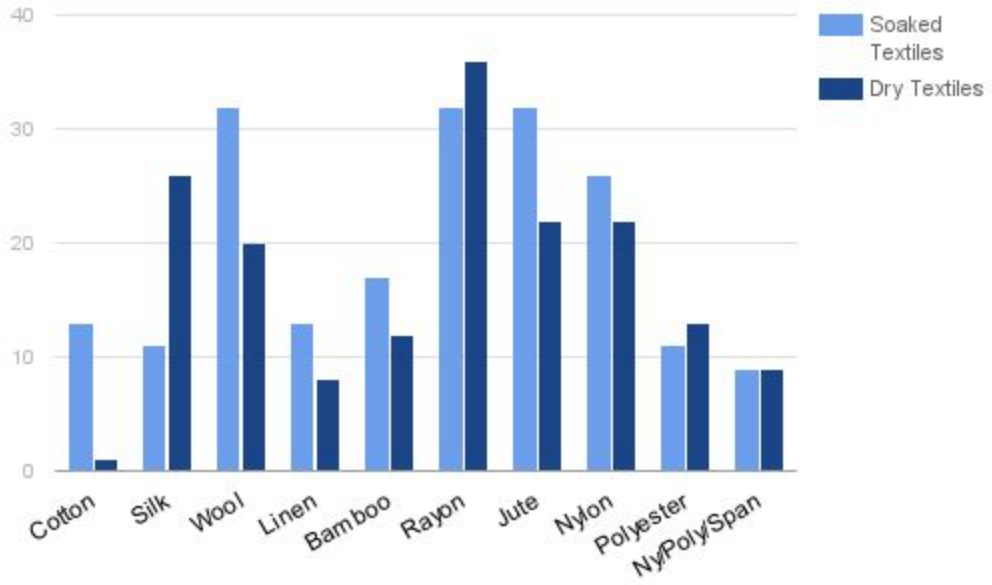
Vat Dye Lab Notes:



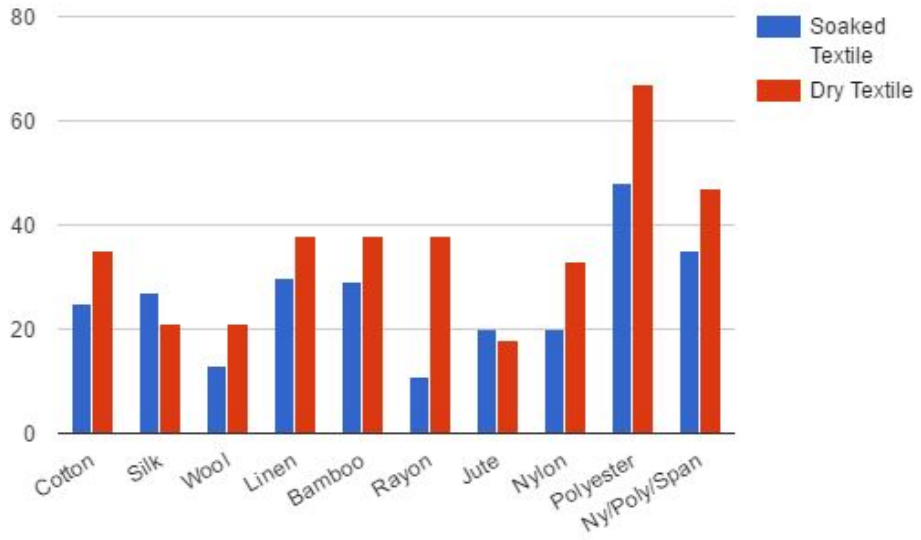
Vat Dye Averages



Highest to Lowest Saturation Percentage



Highest to Lowest Brightness Percentage



Visual Assessment: Best Soaked Indigo

1. Wool
2. Rayon
3. Silk
4. Nylon
5. 64% Nylon, 32% Polyester, 4% Spandex
6. Cotton
7. Linen
8. Jute
9. Bamboo
10. Polyester

Visual Assessment: Best Dry Indigo

1. Silk
2. 63% Nylon, 32% Polyester, 4% Spandex
3. Cotton
4. Linen
5. Wool
6. Jute
7. Rayon
8. Bamboo
9. Nylon
10. Polyester

