COMPARATIVE STUDY OF FASTNESS PROPERTIES OF VAT DYE AND REACTIVE DYE ON COTTON FABRIC
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5.1 Summary

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ABSTRACT

The research work deals on the comparative study of fastness properties of vat dye and reactive dye on cotton fabric. The vat dye and reactive were analysed and review on the various fastness properties using both continues process and lab analysis of the two dyes under survey. The methods used are colour fastness for domestic and laundering using non phosphate incorporated detergent, bleach activator, oxidative bleach response and accelerated methods on cotton fabric. It was found that vat and reactive dyes are good dyes on cotton fabrics. Vat dye and reactive dyes were utilized in continuous dyeing of pure cotton, the comparative study reviewed that the shade matching and washing fastness of reactive dye might be suitable substitutes of vat dyes.
CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Today’s consumer is more sophisticated than ever. They are conscious not only of style and comfort, but also of care and durability. They demand a quality product. Market studies show that consumers make many purchase choices based on colour. Therefore, a fabric’s ability to retain its original colour is one of the most important properties of a textile product.

Colourfastness is defined by the American Association of Textile Chemists and Colourists as “the resistance of a material to change in any of its colour characteristics, to transfer its colorant(s) to adjacent materials, or both, as a result of the exposure of the material to any environment that might be encountered during the processing, testing, storage, or use of the material.” In other words, it is a fabric’s ability to retain its colour throughout its intended life cycle. There are many types of colourfastness.
properties that must be considered to provide the consumer with an acceptable product. The American Association of Textile Chemists and Colourists has over thirty test methods that evaluate different colourfastness properties. These include, but are not limited to wash, light, crock, dry cleaning, perspiration, abrasion and heat. The type of product being manufactured determines which types of colourfastness are important and therefore which test methods are relevant. For example, upholstery fabrics must have excellent light fastness and crock fastness properties, whereas wash fastness is important for clothing fabrics. Manufacturers must know a fabric’s intended end use in order to make processing decisions that will produce a product of acceptable performance.

Dyeing operation is performed by the reaction between fibre and dyes. Some dyes are water soluble and some are water insoluble. Some fibre has affinity to dye; some have no affinity to dyes. So dyeing depends on both fibre and dyes chemical properties.
1.2 Reactive Dyes

Reactive dyes are the most common and huge uses dyes all over the world. Most of the dyeing operation of natural fibre is done by reactive dyes. Reactive dyes have a worldwide acceptance to the dyeing technologist for dyeing cotton. This work is about comparative difference between the properties and colourfastness of two well-known dying methods which are the vat dyes method and reactive dyes method.

Reactive dye is only class of dyes have strong bond with the fibre and becomes a part of it. The classification of reactive dyes are by depending on chemical constitution reactive dyes can be classified as:

1. Chlorotriazine Dyes (MCT)
2. Vinyl Sulphone Dyes (VS)
3. Heterocyclic Halogen Containing Dyes (HHC)
4. Mixed Dyes (MCT-VS). By depending on application methods of temperature, reactive dyes can be classified as:
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**Cold brand reactive dyes:** This type of reactive dyes is applied in very low temperature. Temperature lies between 25 - 50 degree Celsius. They are highly reactive with fibre on this temperature.

**Medium brand reactive dyes:** This type of dyes is applied in a medium temperature range is 40 — 60 degree Celsius. Their reactivity is medium with fibre.

**Low brand reactive dyes:** This type of dyes has very low reactivity properties with fibre with comparison with medium and high brand reactive dyes. Dyeing is carried out on 60 -90 degree Celsius.

**Properties of Reactive Dyes**

Reactive dye is anionic in nature, Reactive dye is a water soluble dye. They have better wash and light fastness properties, they have better substantivity, they form strong co-valent bond with the cellulosic fibre.

Alkaline condition is required for dyeing, Electrolyte is must for exhaustion of dyes in the fibre, A certain amount of dyes are hydrolysed
during application, Wide range of colour can be produced with reactive dyes, Comparatively cheap in price.

1.3 Vat Dyes

Vat dyes are different from reactive dyes, disperse dyes, basic dyes, acid dyes or azoic colour but its application process is near similar as sulphur dyes. Vat dyes are used for colouring cellulose fibre specially cotton fibre. It is widely used for run the dyeing process of cotton yarns which is used for producing jeans or denim product.

The word vat came from vessel; vat dyes can be applied in a vat for coloration textile products. Vat dyes are natural colouring materials which are solubilized in a vat by the fermentation process called vatting. Vat dyes are insoluble in water but it becomes in soluble form by vatting process. The process of converting insoluble vat dyes into soluble form is known as vatting.
Properties of Vat Dyes: Vat dyes have lots of properties which are required to remember before and during dyeing process. Followings are the main properties of vat dyes.

Vat dyes are natural colouring dyes, Vat dyes are insoluble in water, Vatting process is needed for making the insoluble vat dyes into soluble form, Final colour is developed by the oxidation process, Vatting is done in alkaline condition, Fastness properties of the dyes are excellent but its rubbing properties are not so good, Sometimes, it causes different types of skin disease, Vat dyes are mainly used for colouring cellulosic fibres, Stability of the colour in the fibre is excellent, Wide range of colour can be achieved by these dyes, Application of vat dyes is limited in practical life, Vat dyes are expensive in price Cain (1996).

So, it’s very interesting that most of the denim product is collared by vat dyes. The colourfastness or colour retention of cotton textiles is influenced by a number of variables that occur both pre-consumer and post-consumer. This work summarizes how variations in raw materials,
chemicals, manufacturing processes and consumer practices all have an effect on the performance characteristics of a fabric. Manufacturers must understand how the many variables affect colourfastness to achieve the ultimate goal of consumer satisfaction.

1.4 Aims and Objectives

This study investigates the relationships between reactive dye and vat dye methods, properties and the colourfastness and hope to compare the possible properties that shows their differences.

Moreover, some dyes are water soluble and some are water insoluble. Some fibre has affinity to dye; some have no affinity to dyes. So dyeing depends on both fibre and dyes chemical properties. This research specifically will consider the effect of different properties of the two dyes methods on cotton fabric and which of their colourfastness abilities will be the best for cotton fabric.
1.5 Purpose of the Study

The purpose of this study is to conduct and examined the fastness properties of each of the two dying methods and how this methods can be best be used on cotton fabric. The fastness properties of the reactive dyeing methods and vat dyeing will be compared, So as to know which of their colourfastness properties will to be considered best for cotton fabric.

1.6 Significance of the Study

A major concern in the quality cotton fabric and dyes colour is increasing over the ages, this is because test developing with the trend of the technological advancement. Fabric designers are also tend to focus on the centre object which influence the properties of colour because consumer want to buy a better fabric with the best touch of dye on it, people are ready to spend more on good quality fabric most especially ladies want get the best to make them look attractive. To achieve this, the various dyeing methods needed to be considered and create the best dyeing method applicable for cotton that while this study is timely and considered very
significant to move this fabric and colour designer to enable them achieve their objective and give the consumer the best touch on their fabric.
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