Journal of Saudi Chemical Society (2014) **18**, 902–913

King Saud University

Journal of Saudi Chemical Society

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ORIGINAL ARTICLE

Synthesis and dyeing properties of some new monoazo disperse dyes derived from 2-amino-4-(2′,4′-dichlorophenyl)-1,3 thiazole

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Received 29 August 2011; accepted 22 November 2011
Available online 4 December 2011

KEYWORDS

2-Amino-4-(2′,4′-dichlorophenyl)-1;
3 Thiazole;
Monoazo disperse dyes;
Polyester fiber;
Fastness properties

Abstract Ten new monoazo disperse dyes (**4a–j**) have been synthesized by coupling of diazotized 2-amino-4-(2′,4′-dichlorophenyl)-1,3 thiazole (**2**) with various *N*-alkyl derivatives of substituted aniline (**3a–j**) and their dyeing performance on polyester fiber has been assessed. These dyes are characterized by elemental analysis, UV–vis spectra, IR and NMR spectroscopy. The absorption maxima (λ_{max}) were recorded in DMF and were found to be in the range of 530–600 nm. The dyed polyester fabric showed fair to very good light fastness and very good to excellent washing and rubbing fastness properties with superior depth and levelness.

1. Introduction

Disperse dyes are colored organic compounds with relatively small molecular weight and having low water solubility. They are suitable for coloring hydrophobic fibers like cellulose acetate, nylon, polyester and also polypropylene and acrylic fibers from an aqueous dispersion. Very large scale of disperse dyes introduced during the last decade was used to dye polyester and the majority represent advances in application and fastness properties over dyes previously available (Dawson, 1978, 1983).

The increase of Monoazo disperse dye is due to the fact that during this time the range of shades obtainable with monoazo dyes has increased bathocromically. Today a large number of violet to blue Monoazo disperse dyes are available. So the continual research in monoazo disperse dyes is very important. Monoazo dyes with a heterocyclic system is very useful class of disperse dyes. Some very important heterocyclic diazo components such as thiazoles, isothiazoles, thiadiazoles, thiophenes, and 4-oxoquinazolines give very good disperse dyes with excellent all round fastness properties (Weaver and Shuttleworth, 1982). Some of the heterocyclic azo dyes have excellent brightness, intensity, fastness properties, compared

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Peer review under responsibility of King Saud University.

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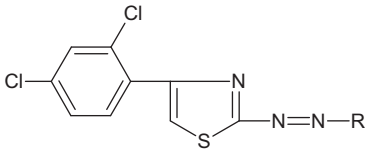
http://dx.doi.org/10.1016/j.jscs.2011.11.012

with their benzenoid counterparts and are commercially competitive with anthraquinone dyes. The bathochromic effect of the heterocyclic system was originally associated with the sulfur atom, but it is now thought that the diene character of the heterocycle is responsible for the shift (Griffiths, 1976). Dyes with aniline type coupling components containing one or more *N*-alkyl groups showed increased value of light and sublimation fastness (Towne et al., 1958; Weaver and Straley, 1970). Various researchers have proved the utilization of thiazole molecule in the synthesis of some significant disperse dyes (Peters and Gbadamosi, 1992; Bello, 1995; Hallas and Choi, 1999; Towns, 1999).



(4a-j)

Figure 1 General structure of disperse dyes (**4a–j**) Where R = Different *N*-alkyl derivatives of substituted aniline (**3a–j**) Table 1.

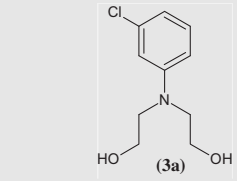
In continuation of our work toward the synthesis of disperse dyes (Patel et al., 2003), we report here the synthesis and dyeing properties of some new monoazo disperse dyes derived from the building block 2-amino 4-(2′,4′-dichlorophenyl)-1,3 thiazole moiety and its dyeing performance has been assessed on polyester fibers. The spectral characteristics, visible absorption spectra, exhaustion, fixation and fastness properties data were also reported. The general structure of the newly synthesized acid dyes is shown in Fig. 1.

2. Experimental

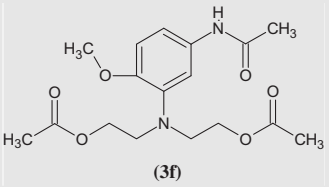
2.1. Material and methods

All the chemicals used in the dyes synthesis were of commercial grade and were further purified by crystallization and distillation. Melting points were determined by the open capillary method and are uncorrected. The purity and R_f values of all the dyes were checked by Thin Layer Chromatography (Fried et al., 1982). The absorption spectra were measured using Shimadzu UV-1700 spectrophotometer at a maximum wavelength (λ_{max}). IR spectra were recorded on Perkin–Elmer model 881 spectrophotometer using KBr pellets in the range of 4000–400 cm^{-1}. ^1H and ^{13}C NMR spectra were recorded on Bruker Avance II 400 MHz (^1H NMR) and 100 MHz (^{13}C

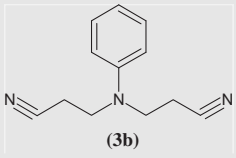
Table 1 Coupling components (**3a–j**).



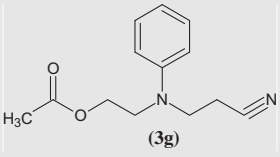
(3a)



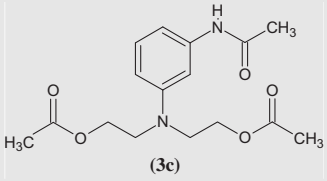
(3f)



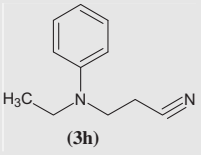
(3b)



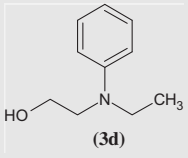
(3g)



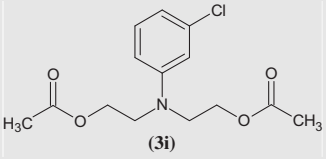
(3c)



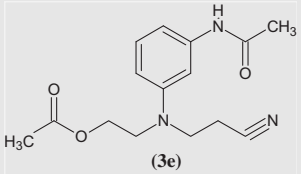
(3h)



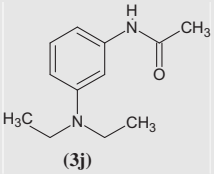
(3d)



(3i)



(3e)



(3j)