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EOSIN Y-CATALYZED VISIBLE LIGHT MEDIATED DIRECT C(SP^2)-H BOND AZO COUPLING OF IMIDAZO[2,1-*B*]THIAZOLE WITH ARYL DIAZONIUM SALTS

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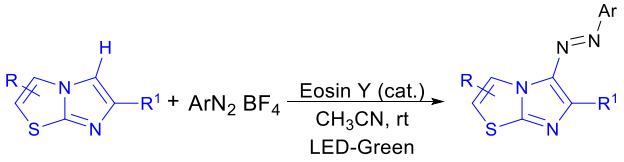
Resumo

Herein, we describe a greener approach to the eosin Y-catalyzed, C(sp^2)-H bond azo coupling of imidazo[2,1-*b*]thiazole with aryl diazonium salts, under acid free conditions. This direct photoredox process resulted in the corresponding azo products in good to excellent yields.



Graphical Abstract

Palavras-chave: Green chemistry, Photo-catalysis, organic synthesis.

Apoio financeiro: PIBIC, CNPQ, CAPES.

Trabalho selecionado para a JNIC: UFSC, UFMS.

Introdução

Imidazo[2,1-*b*]thiazole (IT) derivatives have been of interest to the medicinal chemists for many years because of their anticancer [1], antitubercular [2], antibacterial [3], antifungal [4], anticonvulsant, analgesic [5], and antisecretory [5] activities. Besides, aryl-azo compounds are widely used in several areas, including the chemical industry, pharmaceuticals, chemo-sensors, electronics and liquid crystals (**1a-b**, Figure 1).[6-7]

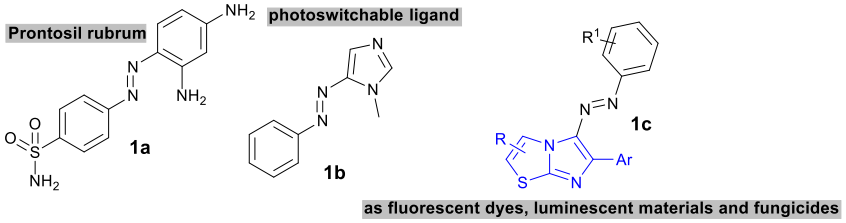


Figure 1. Examples of important azole-heterocyclic azo derivatives.

The development of new synthetic procedures to obtain multi-targeted hybrids of these skeletons (aryl-azo imidazo[2,1-*b*]thiazole) in a single structure would be useful, due to their diverse applications (**1c**, Figure 1).[8]

As part of our research interest in designing and developing sustainable processes as well as in the C(sp^2)-H functionalization of biologically relevant heteroarenes,[9] herein, we disclose for the first time a photo-induced eosin Y-catalyzed azo coupling of imidazo[2,1-*b*]thiazole with aryl diazonium salts.

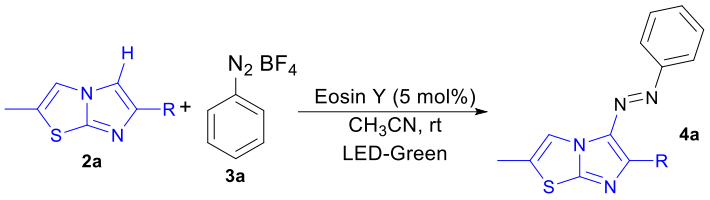
Metodologia

Proton nuclear magnetic resonance spectra (^{1}H NMR) were obtained at 200 MHz on a Bruker AC-200 NMR spectrometer or at 400 MHz on a Varian AS-400 NMR spectrometer. Spectra were recorded in $CDCl_3$ solutions. Chemical shifts are reported in ppm, referenced to the solvent peak of $CDCl_3$ or tetramethylsilane (TMS) as the external reference. High resolution mass spectra were recorded on a Bruker microTOF-Q II APPI/APCI mass spectrometer equipped with an automatic syringe pump for sample injection. The melting points were determined in a Microquimica MQRPF-301 digital model equipment with heating plate. Column chromatography was performed using Silica Gel (230-400 mesh). Thin layer chromatography (TLC) was performed using Merck Silica Gel GF_{254}, 0.25 mm thickness. For visualization, TLC plates were either placed under ultraviolet light, or

stained with iodine vapor and acidic vanillin. Most reactions were monitored by TLC for disappearance of starting material.

Resultados e Discussão

For the optimization of the reaction, **2a** and 3a were selected as model substrates. Ideal condition was achieved by using one equiv. of imidazo[2,1-*b*]thiazole **2a**, one equiv. of phenyl diazonium tetrafluoroborate **3a**, eosin Y (5 mol%) as a catalyst and 2 mL CH_3CN under irradiations of green LED, with a reaction time of 2 h at rt (Scheme 1).



Scheme 1. Optimized reaction condition using **2a** and **3a** as substrates

After optimization, the synthetic versatility of this protocol was checked and the reaction scope was tested using different IP cores of imidazo[2,1-*b*]thiazoles **2** with diazonium salt **3** (Figure 2).

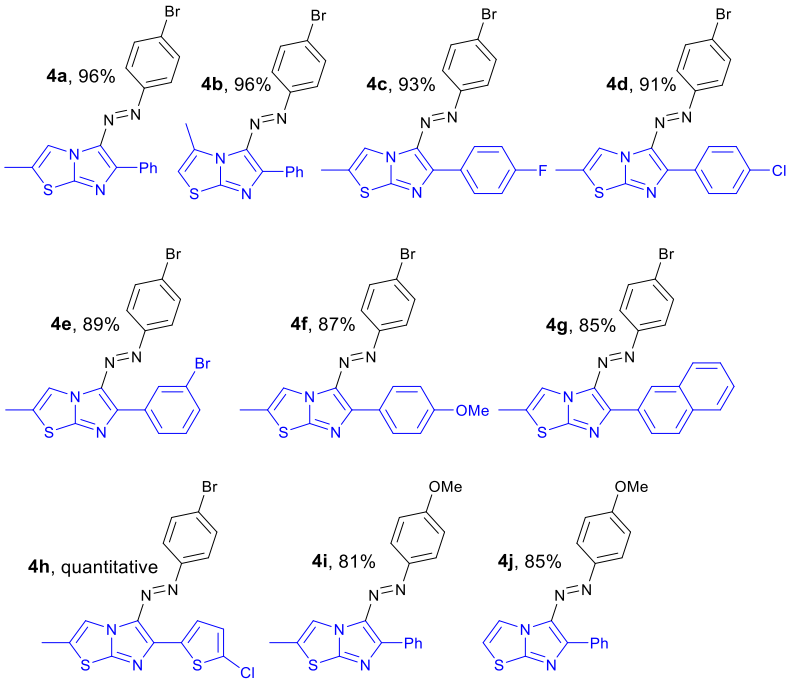


Figure 2. Scope of the reaction.

Conclusões

In conclusion, we have developed an acid free, eosin Y-catalyzed procedure for the direct C(sp^2)-H bond azo coupling of imidazo[2,1-*b*]thiazole with aryl diazonium salts. Under the optimized reaction conditions, this photo-redox approach worked efficiently to form the azo products in good to excellent yields.

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