

DIMEDONE BASED AZO DYE AS pH-RESPONSIVE ISOMERIZABLE MATERIAL

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Azo compounds are a significant class of organic molecules characterized by the presence of one or more azo ($-N=N-$) groups within a conjugated system. These compounds play a crucial role in modern materials science, serving as key components in dye chemistry, photonic applications, and nonlinear optical (NLO) devices. Due to their ability to form stable coordination complexes and undergo reversible photoinduced transformations, azo derivatives have been widely explored for use in optical sensors, molecular switches, high-performance pigments, and advanced photofunctional materials. Additionally, their tunable electronic properties make them valuable candidates for applications in light-driven actuators, electrochromic displays, and solar energy harvesting technologies. Dimedone represents a significant class of compounds due to its distinctive keto group, which can undergo tautomeric conversion into the enol form. In azo-dimedones, this structural feature allows for the formation of a hydrazone form, making these dyes particularly interesting in terms of both pH and metal ion sensitivity. Additionally, the presence of the azo ($-N=N-$) group introduces the potential for reversible isomerization, further enhancing their applicability in responsive optical materials and functional molecular systems.

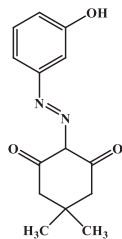


Fig. 1. Azo Dimedone Structure

In this work, an azo dye (Fig. 1) based on dimedone and 3-aminophenol was synthesized through a diazotization reaction followed by azo coupling. To study the spectral properties, a solution in ethanol was prepared and the sensitivity to pH changes and irradiation was studied.

The UV-Vis absorption spectra of the azo dye were recorded under varying concentrations of HCl (left) and NaOH (right) to investigate its pH-dependent optical properties (Fig. 2). A notable absorption band at 408 nm is observed in both acidic and basic media, with slight shifts in intensity, indicating electronic transitions influenced by protonation and deprotonation. In the presence of NaOH, additional absorption peaks appear at 281 nm and 346 nm, suggesting structural

modifications due to deprotonation or tautomeric equilibrium shifts. A study of photoinduced isomerization of an azo compound in ethanol demonstrated a reverse *trans-cis* transition with a rate constant $7.42 \cdot 10^{-4} \text{ s}^{-1}$. These spectral variations highlight the dye's sensitivity to pH changes, making it a potential candidate for use as a pH-responsive optical material.

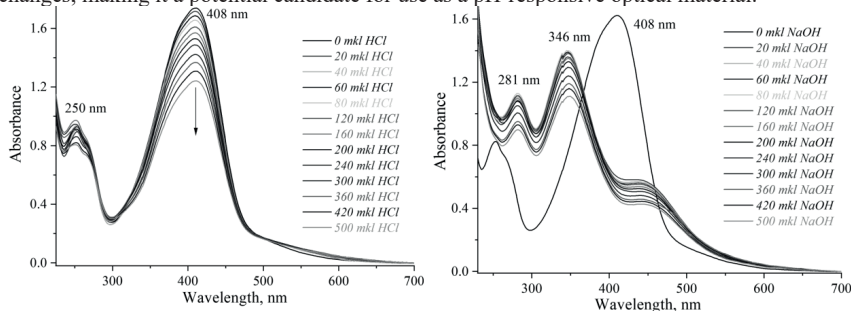


Fig. 2. UV-Vis Absorption Spectra of Azo Dimedone Changes as a Function of pH