Syntheses and Characteristics of Infrared Dyes

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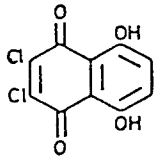
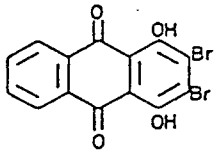
There is a current interest in the development of suitable dye medium for use in diode-laser optical storage. New naphthoquinonoid dyes and anthraquinonoid ir dyes(λ max 700-850 nm) have been designed by means of the Pariser-Parr-Pople molecular orbital method (PPP MO) and synthesized using new method.

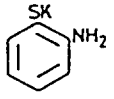
The reaction of 2,3-dichloronaphthazarin 1a with 2a gives the 1,4-bis-ring-closure product 3a in 86% yield. Dye 3a is green in color and absorbs ir light at 727 nm. The reaction of 2,3-dibromoquinizarin 1b with 2a gives 4a in quantitative yield which absorbs at 712nm.



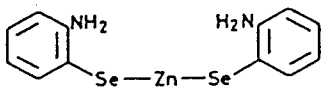
1a



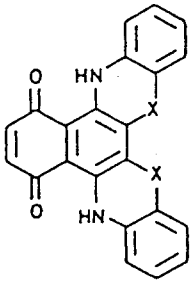
1b



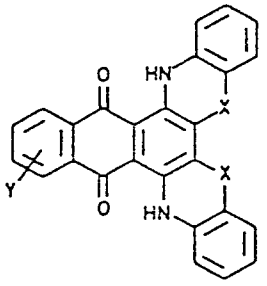
2a



2b



3 a, X=S
b, X=Se



4 a, X=S Y=H
b, X=S Y=F_4
c, X=Se

Introduction of acceptor groups at 5-8 positions of **4a** produces a large bathochromic shift as shown in 4b. Phenoselenazinequinone dyes could be synthesized by the reaction of **1a** with **2b**. Inthis reaction, the bis-ring-closure product 3b were obtained. The anthraquinone analogues **4c** could be synthesized by the reaction of the 1b with **2b**. Phenoselenazinequinone dyes generally absorbs at much longer wavelength than the corresponding phenothiazine dyes.

The new organic materials developed by using these ir dyes can be recorded and played back by a laser diode through a substrate, and shows long-term stability.