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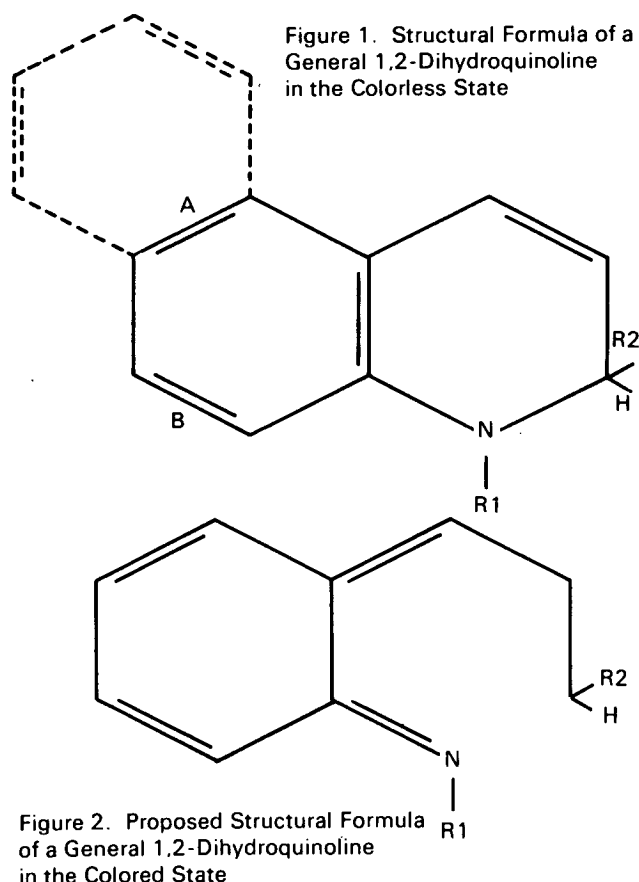
NASA TECH BRIEF



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Photochromism of Dihydroquinolines

Reversible photochromic reactions, in which the absorption spectrum of a chemical compound may be shifted by the application of visible or ultraviolet light, and then returned to the original state by heating, have been observed for certain members of the 1,2-dihydroquinoline family. These compounds are



represented by the structural formula shown in Figure 1, where R1 and R2 represent hydroxyl, halogen, or organic substituents, and in addition, where a benzo condensation may be made across position A or B (shown in dotted lines at position A).

The compounds may be dissolved in various organic solvents or in plastic matrices such as polymethylmethacrylate or polycarbonate resins. In a recent series of experiments, they were dissolved in a solvent composed of ethyl ether, isopentane, and ethyl alcohol, in a 5:5:2 volumetric ratio (referred to as "EPA"). The table shows the specific substituents, the observed coloration in EPA, the percent reversibility and the maximum temperature at which coloration occurred, for several compounds which have been investigated. Also, the substituents are shown for three as-yet-unsynthesized compounds for which photochromic activity has been predicted.

Figure 2 shows the proposed structure of the colored form of the 1,2-dihydroquinolines. This hypothesis has been derived by analogy with the known colored form of a related family, the chromones. The theory will be tested during a more detailed investigation of the photochemistry and spectroscopy of the dihydroquinolines, currently in progress.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
 Headquarters
 National Aeronautics
 and Space Administration
 Washington, D.C. 20546
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(continued overleaf)

Photochromic 1,2-Dihydroquinoline Compounds

No	Photochromic Substituents		Benzo Condensation	Color in EPA at 77°K	Highest Coloration Temp. (°K)	Percent Reversability
	R1	R2				
1	COC ₆ H ₅	CN	None	Brownish Red	200	97-98
2	CO ₂ C ₂ H ₅	CN	None	Orange	200	Low
3	CO ₂ C ₂ H ₅	OC ₂ H ₅	None	Pink	270	99
4	CN	OH	None	Blue	77	Low
5	COC ₆ H ₅	CN	Site A	Yellow	200	97-98
6	CN	CN	None	Predicted	—	—
7	CN	CO ₂ C ₂ H ₅	Site B	Predicted	—	—
8	CO ₂ C ₂ H ₅	CN	Site B	Predicted	—	—

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Dr. R. S. Becker and
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University of Houston
under contract to
NASA Headquarters
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