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Marshall Space Flight Center



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Erasable Holographic Medium Using Cis-Trans Isomerization

A photochemical process has been developed for the recording of erasable holograms by utilizing the reversible transformation of two isomers of a molecule upon exposure to light. The hologram system records, reads, and erases in response to changes in the refractive index of the mixture of isomers. The cis and trans isomers of α - methylstilbene have been extensively studied and were selected for use in the system. In a system containing the sensitizers eosin, duroquinone and α - methylstilbene, the absorption maximum of eosin is at 519 nm and of duroquinone at 335 nm. There is significant absorption of duroquinone at 350 nm which corresponds approximately to an absorption minimum of eosin. Thus, the two sensitizers may be excited independently. The initial composition of the system is 90 percent cis isomer and 10 percent trans isomer. The hologram is written with light absorbed by eosin, 519 nm. When this material is irradiated, the composition changes. The maximum change corresponds to cis-trans ratios of 0.20 rather than the initial 9.0; thus, the refractive index of the light struck material has changed. The hologram is read with radiation absorbed by neither sensitizer so the hologram will be unperturbed by the reading process. It is erased by uniform irradiation with light absorbed by duroquinone. This will restore the original composition.

A useful system requires higher sensitivity than calculations show for this system. Higher sensitivity can be obtained by using cis-trans pairs having larger differences in absorption frequencies. This should be

attainable by placing substituents on the α - methylstilbene that would increase the dipole moment of the trans isomers.

Notes:

1. Information concerning this innovation may be of interest to personnel engaged in the development of hologram systems. This holographic technique may be developed to become part of various computer systems.
2. Requests for further information may be directed to:
Technology Utilization Officer
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Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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