

NASA TECH BRIEF

Marshall Space Flight Center



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Dichromated-Gelatin Hologram Process for Improved Optical Quality

The problem:

One form of optical distortion in dichromated-gelatin holograms that are larger than a few centimeters in diameter is caused by thickness variations in the gelatin. These variations appear to be associated with local variations in the rate of dehydration of the swollen gelatin layer during development.

The solution:

The distortion is eliminated by the use of a wetting agent followed by sequential immersion in several alcohol-water baths of increasing alcohol concentration.

How it's done:

The standard procedure for an exposed dichromated gelatin hologram plate is to immerse it in water for approximately 5 minutes. The plate is then immersed in 100 percent isopropanol to remove the water from the gelatin layer. When the wet plate is first inserted into the isopropanol bath, random concentration gradients are observed at the surface of the gelatin layer as the residual water on the gelatin surface mixes with the isopropanol. At the completion of the development and drying process, the gelatin reticulation patterns are similar in shape and distribution to the previously-observed concentration gradients. These patterns are eliminated by adding steps to the development process.

After rinsing in water, the plate is immersed for 30 seconds in a 1:200 bath of wetting agent in water. This leaves a thin uniform layer of water on the gelatin surface. The dehydration is accomplished in four additional steps. The plate is immersed and agitated for 2 minutes each in baths containing 50, 75, and 90 percent isopropanol well mixed in water. The final bath is 100 percent isopropanol. In this way, the dehydration proceeds uniformly over the surface of the gelatin. The dried plate is free of the optically-distorting thickness variations.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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NASA has decided not to apply for a patent.

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