THE ELIMINATION OF LOW INTENSITY RECIPROCITY FAILURE ON HYPERSENSITIZED KODAK IIIaJ PLATES

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Abstract. The residual low intensity reciprocity failure, which is a property even for hypersensitized IIIaJ plates, for exposures between one and eight hours has been successfully eliminated by flushing the plates with a stream of dry nitrogen during exposure.

1. Introduction

Various workers have shown that the low intensity sensitivity of certain photographic emulsions may be increased by subjecting them to a variety of different atmospheres and temperatures. Lewis et al. (1971) have shown that the low intensity reciprocity failure of emulsions which have been subjected to these treatments exhibit a lower reciprocity failure than untreated emulsions. Babcock et al. (1974) have shown that useful speed increases on Kodak IIIaJ plates and a reduction in their low intensity reciprocity failure may be achieved by hypersensitization in hydrogen. However after such treatments reciprocity failure is still evident. The method of hypersensitization in use at the UKSTU (United Kingdom Schmidt Telescope Unit) developed by Corben et al. (1974) and Hawarden et al. (1976) consists of long term nitrogen soaking of the plates; typically for 80 days followed by a short term soak in hydrogen for four to eight hours.

Plates hypersensitized by this method exhibit appreciable gains in speed and reduced low intensity reciprocity failure. Unfortunately, total elimination of reciprocity failure does not occur, a residual amount remains. In certain applications (Kaye and Meaburn, 1976) it is essential to eliminate this residual reciprocity failure. A simple but effective technique is described here which uses a stream of nitrogen flowing over the plates during exposure to remove the residual reciprocity failure for exposure times between 1 and 8 hours.

2. Experimental

HYPERSENSITIZATION

Two batches of Kodak IIIaJ plates were hypersensitized by subjecting them to the following treatments.

(a) Batch 1
The plates were soaked for 77 days in an atmosphere of nitrogen at 20°C followed by a
4-hour soak in hydrogen at 20°C.

(b) Batch 2
The plates were soaked for 88 days in an atmosphere of nitrogen at 20°C followed by a 4-hour soak in hydrogen at 20°C.

EXPOSURE
(a) In air
For determining the degree of low intensity reciprocity failure exhibited by this hypersensitized emulsion plates from the first batch were exposed for times ranging from 1 to 8 hours in a spot sensitometer which produces an intensity range of 1000:1. The light source for the sensitometer was a low voltage QI lamp operated from a well stabilized supply. Its spectral output was restricted to wavelengths in excess of 3950 Å by filtration using a Schott glass filter GG 395. After exposure the plates were stored in nitrogen before processing; in all cases processing was performed within twelve hours of exposure.

(b) In a flow of nitrogen
Hypersensitized plates from the second batch were given exposure times of 1 hour and 8 hours in the spot sensitometer with a stream of nitrogen passing over the plates at a

Fig. 1. Plate holder and end view of sensitometer.