MODELING THE APPEARANCE
OF FLUORESCENT COLORED MATERIALS

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ABSTRACT

Many interesting theoretical questions have accompanied the increased deployment of durable fluorescent colored materials in traffic safety applications (e.g., highway signs, safety vests). One of the more theoretically “vexing” issues will be presented here: namely, specifying the psychophysical relationship between the photometric properties of fluorescent materials and their psychological appearance. A primitive but potentially powerful model is proposed to account for both the fluorescent color appearance threshold \( G_0 \) as proposed by Evans, 1974) as well as provide a wavelength-dependent scale for expressing the magnitude of fluorescent color appearance (i.e., “fluorence”). This model can be expressed as

\[ F = \frac{Y}{Y_m}, \]

where,

- \( F \) = magnitude of fluorescent appearance (i.e., fluorence)
- \( Y \) = relative reflectance of a colored surface \( (Y=100 \text{ for reference “white”}) \)
- \( Y_m \) = MacAdam Limit for the “optimal color” at a given chromaticity

A psychological scale of fluorescent color appearance based the use of the MacAdam Limit as a normalization function was first proposed by Schultze (1953). Unfortunately, he was unable to provide data to support this elegant hypothesis. The current study identifies two data sets that are now available to test the model. Curve fits to these data sets revealed that the model accounted for between 85-95 per cent of the scaled appearance data (using magnitude estimation as well as Thurstonian scaling techniques). This model has important implications for the specification and study of the efficacy of traffic control devices.

REFERENCES