

Reaction-kinetic processes of the emergence of the latent image and the photographic blackening

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Abstract

The article is a rearranged and for better comprehensibility reworked excerpt of the postdoctoral thesis of the author, which concerns especially the reaction-kinetic process of the step-like build-up of development specks in the lattice of silver halide crystals in a photographic emulsion during the exposure to light:
www.ewald-gerth.de/habilitation.pdf Book: ISBN 978-3-8316-4299-1.

The analytical representation as a system of differential equations, the solution of which provides a sequence of linear vector transformations by means of matrices, leads to a new theory of the photographic elementary process. The vector of the initial distribution of specks of different reaction order arranged in a reaction chain is redistributed by multiplication with a reaction matrix – the so-called “exposure matrix”, which contains all exposure parameters.

The formulation of the process by matrices gives new explanations of many phenomena observed empirically at photographic materials. There are above all the photographic effects like those established by *Schwarzschild* and *Weinland*. The *Schwarzschild*-effect is explained by setting an equilibrium of forward and back reactions by recharging the specks with free electrons between the first two steps in the reaction chain. The *Weinland*-effect shows the non-commutativity regarding the blackening result of two consecutive exposures with equal light quantity $E \cdot t$ (E intensity, t time) but different values of E and t , which is explained by the non-commutative multiplications of different exposure matrices. But also other photographic effects are in good accord with the theory of the matrix-based formulation of the photographic process.

There was not found any disagreement.

The photographic effects are demonstrated relating to the results of the postdoctoral thesis of the author.

Comment of the author in 2009:

The present article was published in 1973 in the professional movie-technical journal BILD UND TON. The journal was distributed only in the restricted zone of the GDR, so that it is nearly impossible to get any exemplar even from a library. Therefore, in order to make the article available for the interested reader, the author decided to install the full text in the INTERNET.

Article available in German by the web-address: www.ewald-gerth.de/41.pdf