

General outline of the modern theory of the photographic process

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Abstract

The article gives a brief review of the literature on the photographic primary process in crystals of silver halide and the endeavors of theoretical interpretation from the very beginning up to its publication in 1963.

The description of the photographic process starts from the photoelectric effect with the release of free electrons and defect-electrons mainly at the spectrally photo-sensitive lattice defects in the crystal. By recharging the defects of silver-ions and defect-electrons a step-like growth of silver conglomerates takes place, which – up from a definite size – initiate the reduction of the entire silver halide crystal to a metallic silver grain, establishing thus the latent image. Because of the light-sensitive property of silver halide the investigation of the action of color-centers is performed at model substances like potassium halide.

Then the composition and the embedding of the halide crystals in the gelatine emulsion as well as the interaction with the developer is considered. The transformation of silver halide crystals into metallic silver grains is demonstrated by instructive stereo pictures for physical and chemical development.

Comment of the author E. Gerth in 2009:

The present article – originally meant as the preparatory literature recherche for the author's thesis – was published in 1963 in the professional movie-technical journal “BILD UND TON” on recommendation of the Technical Director of DEFA Prof. Dr. A. Wilkening. The journal was distributed only in the restricted zone of the GDR, so that it is nearly impossible, to get an 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.

The article, which relates exclusively to published literature, reflects the developments of research in the field of the photographic process up to 1963. One could ask now, whether such old treatises from half a century ago in our times may be “out of date”. The author, however, has pursued the developments in this field up to now. After his knowledge, the investigation of the photographic primary process in crystals of silver halides has come to an end about the year 1970 – as it was confirmed in 1974 at the international conference on photo-physics in Dresden, where the author was present. The later following developments concern only some marginal improvements like sensitivity, build-up of layers, graininess, resolution, color-coupling etc.

Afterwards, the guiding part in photo-physics was overtaken by the digital photography.

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