

Analytic derivation of Schwarzschild's blackening law from the exposure matrix

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Abstract

Schwarzschild's law of blackening for constant photographic density is derived from the exposure matrix as a reaction-kinetic approximation law of the efficient quantities *intensity* and *time* of exposure, expanding the under angle element into a series of exposure time and setting it constant. The lowest order of the power products occurring in the series corresponds to the number of the step transitions of the reaction chain of speck build-up, passed without back reactions. Because of the occurrence of a reaction equilibrium between the initial speck step and the first, very unstable speck step the reaction order of the time is diminished by one step, whereas the reaction order of the intensity does not change. Taking in consideration the condition of convergence, the series provides a power product of the efficient quantities with different exponents in the form of Schwarzschild's law.

Comment of the author in 2016:

The article on the derivation of Schwarzschild's blackening law is an extended and reworked excerpt from the habilitation thesis of the author:

www.ewald-gerth.de/habilitation.pdf.

The definition of the exposure-matrix is given in

www.ewald-gerth.de/43.pdf.

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