



Physical development of Lippman emulsions (G)

Research Disclosure Database Number 125001
(Research Disclosure Journal Number : 12501)

Published in September 1974

The Research Disclosure Journal is normally published and distributed on the 10th of every month unless that date coincides with a weekend or public holiday, when it is published directly afterwards. In these cases it is always published by the 12th of every month. Every disclosure is also placed on the RD Electronic database as soon as it is received and it may be published on the database prior to being published in the next edition of Journal.

Research Disclosure is the unique international defensive publication service that allows the world's intellectual property community to establish prior art, and provides an alternative to obtaining a patent at a fraction of the cost and the time taken. It is the world's longest running, independent, industry standard prior art disclosure service.

Kenneth Mason Publications Ltd give consent for this disclosure to be printed out providing it is for personal use, or for the personal or internal use of patent examiners or specific clients only. Photocopies may be made providing it is for personal use, or for the personal or internal use of patent examiners or specific clients and not for resale and the copier pays the usual photocopying fee/s to the relevant Copyright Clearance Centre. This consent does not extend to abstracting for general distribution for advertising, or promotional purposes, for creating new collective works or for resale. This consent also does not extend to other kinds of scanning, printing or copying, such as printing, scanning or copying for general distribution for advertising, or promotional purposes, for creating new collective works or for resale. Document delivery services are expressly forbidden from scanning, printing or copying any Research Disclosure content for re-sale unless specifically licensed to do so by the publishers.

Research Disclosure Journal, ISSN 0374-4353. © Kenneth Mason Publications Ltd
The Book Barn, Westbourne, Hants. PO10 8RS. UK
Tel: +44 (0)1243-377977 Fax: +44 (0)1243-379136
e-mail : info@ResearchDisclosure.com

Physical development of Lippmann emulsions (G)

12501

Photographic materials for microelectronic mask-making should have a high resolving power in order to allow a correct reproduction of the dimensions of the image. For this purpose, it is known to use photographic silver halide elements comprising a support, especially glass supports in view of their high dimensional stability, coated with a silver halide emulsion layer of the Lippmann type is an emulsion having an average grain size of 100 nm or less.

The image-sharpness of the masks produced, both on reversal and negative processing, does not always meet the requirements, especially where reproduction of very fine image details is concerned. Apart from the disadvantageous effect of light-scattering within the emulsion layer, which can be reduced by the use of light-screening dyes, there may be another cause for lack of sharpness namely the granularity of the silver image. The filamentary structure of the silver produced upon development may indeed cause unsharpness especially at the edges of very fine image details.

In the interest of image sharpness development can be adapted so that the silver particles grow more at equal rates in all directions resulting in a developed image composed of compact rounded particles rather than the formation of a filamentary silver image (see Mees and James, *The Theory of the Photographic Process*, 3rd Ed, 1966, Chapter 15 – The Mechanism of Development, p 324 - 332).

Instead of chemical or direct development of the exposed photographic elements for microelectronic mask making, the exposed elements can be subjected to physical development which promotes the formation of nearly spherical silver rather than filamentary silver. It is known that in physical development the development centres formed by exposure are grown by depositing thereon metallic silver or another metal from the developing solution containing a soluble metal salt or complex as a source of free metal ions eg silver nitrate and a reducing agent which is normally an ordinary developing agent such as hydroquinone, metol, p-amino-phenol or p-phenylene diamine developing agents.

Pure physical development occurs by means of a solution comprising an ordinary developing agent and a soluble silver salt eg silver nitrate as well as additions to adjust pH and silver ion concentration to suitable values eg for the latter purpose silver complex forming substances such as sulphites, thiocyanates, thiosulphates, etc. However, it is also possible to use solutions containing no added soluble silver salt but according to which silver ions from the silver halide grains pass into solution and thus contribute silver to the developed images (this is known as solution physical development). These solutions can be ordinary photographic developers having high solvent activity for silver salts eg by the presence of silver complexing agents such as thiocyanates, sulphites, thiosulphates, etc.

For improving the sharpness of the developed image by reducing or eliminating the formation of filamentary silver during development it is also possible to start development with a developing solution of low solvent action for silver halide, which is a pure chemical development and then continue development with a solution of high solvent action for silver halide, that acts largely by solution physical development. Alternately, the exposed photographic material is first slightly chemically developed so as to form more spherical-like silver instead of filamentary silver, whereupon the density is increased by treatment with a purely physical developer containing a soluble silver salt and a developing agent.

The physical development methods described hereinbefore for exposed photographic elements for microelectronic mask-making may be used for the formation of negative as well as reversal images. For the latter purpose, the exposed silver halide is developed chemically, the developed silver is bleached out, the remaining unexposed silver halide is rendered developable eg by an overall exposure and the silver halide is then subjected to physical development by methods as referred to hereinbefore.

Disclosed anonymously

12501