DIRECT POSITIVE COLOR LIGHT-SENSITIVE MATERIAL

FIELD OF THE INVENTION

This invention relates to a direct positive color light-sensitive material which provides a direct positive color image when imagewise exposed and subjected to color development processing after or simultaneously with fogging processing.

BACKGROUND OF THE INVENTION

Photographic processes for obtaining a direct positive image without reversal processing or without the use of a negative-working film have been well known.

Conventionally known processes of forming positive images using direct positive silver halide photographic light-sensitive materials can be classified into two main types from the standpoint of practical usefulness, excluding special types.

One type of such processes employs a previously fogged silver halide emulsion, in which fogging nuclei (latent image) in exposed areas are destroyed by solarization or the Hershel effect to obtain a positive image after development processing.

Another type uses an internal latent image-forming silver halide emulsion not having previously been fogged, in which, after imagewise exposure, surface development is conducted after or simultaneously with fogging processing to obtain direct positive images.

The above-described internal latent image-forming silver halide photographic emulsion is a silver halide photographic emulsion of the type which contains light-sensitive nuclei mainly within the interior of silver halide grains and forms a latent image mainly within the interior of grains upon being exposed to light.

The latter processes generally give a higher sensitivity than the former processes and are therefore suited for uses requiring high sensitivity. The present invention relates to a process of the latter type, using a non-prefogged internal latent image-forming silver halide emulsion.

In this technical field, various techniques are known, as described in, for example, U.S. Pat. Nos. 2,592,250, 2,466,957, 2,497,875, 2,588,982, 3,317,322 2,497,875, 3,761,266, 3,761,276, and 3,796,577 and British Pat. Nos. 1,151,363, 1,150,553, and 1,011,062.

Photographic direct positive light-sensitive materials having comparatively high sensitivity can be prepared by employing these known techniques.

Detailed descriptions of the mechanism by which direct positive images are formed are described in, for example, T. H. James; *The Theory of the Photographic* Process, (4th ed.), chap. 7, pp. 182–193 and U.S. Pat. No. 3,761,276.

That is, it is believed that fogging nuclei are selectively formed only on the surface of those silver halide grains in unexposed areas by surface-desensitizing action due to an internal latent image formed by the first imagewise exposure within the interior of silver halide grains, and that a photographic image (direct positive image) is formed in unexposed areas by subsequent ordinary "surface development processing".

As is described above, two processes are generally known for selectively producing fogging nuclei: one being a process of giving a second exposure all over the light-sensitive layer, which is referred to as a "light-fogging process" (described in, for example, British Patent 1,151,363); and the other being a process of using a nucleating agent, which is called a "chemically fogging process". The latter process is described in, for example, *Research Disclosure*, vol. 151, No. 15162 (Nov., 1976), pp. 72–87.

Formation of direct positive color images may be attained by subjecting an internal latent image-forming silver halide light-sensitive material to surface color development processing after or simultaneously with fogging processing, then bleaching and fixing processings or bleach-fixing processing, after which the material is usually washed with water and/or subjected to stabilization processing.

Many conventional processes have been disclosed for enhancing the interlayer effect in surface latent image-forming, negative-working color photographic light-sensitive materials to thereby improve color reproducibility.

The interlayer effect is described in, for example, Hanson; *Journal of the Optical Society of America*, Vol. 42, pp. 663–669, and A. Thiels; *Zeitschrift fur Wissenschaftliche Photographie, Photophysicue und Photo-chemie*, Vol. 47, pp. 106–118 and 248–255.

One process for enhancing the interlayer effect is a process of using DIR couplers capable of reacting with an oxidation product of a developing agent to release a development inhibitor. The DIR couplers are couplers having at the coupling-active site thereof a group which is to be released to form a development inhibitor or a precursor of such a group. Specific examples are described in, for example, U.S. Pat. Nos. 3,227,554, 3,701,783, 3,615,506, and 3,617,291.

U.S. Pat. No. 3,536,486 describes the introduction of a diffusible 4-thiazoline-2-thione into an exposed color reversal photographic element, and U.S. Pat. No. 3,536,487 describes the introduction of diffusible 4-thiazoline-2-thione into an unexposed color reversal photographic element, to obtain an interlayer effect.

JP-B-48-34169 (The term "JP-B" as used herein means an "examined Japanese Patent application") discloses that a remarkable interlayer effect is obtained by allowing an N-substituted-4-thiazoline-2-thione compound to be present upon development of color photographic materials whereby silver halide is reduced to silver.

In addition, (*Research Disclosure*, No. 13116 (Mar., b **1975**) describes providing a colloidal silver-containing layer between a cyan layer and a magenta layer of a color reversal photographic element for obtaining an interlayer effect.

Further, U.S. Pat. No. 4,082,553 describes a technique for obtaining an interlayer effect by incorporating latent image-forming silver haloiodide grains in one layer of a color reversal photographic material having a layer structure which permits iodide ions to migrate therethrough during development, and incorporating in another layer latent image-forming silver halide grains and silver halide grains having been surface-fogged so as to be developed regardless of imagewise exposure.

However in direct positive light-sensitive materials, the above-described process using DIR couplers has the serious defect that color development is extremely delayed, and the other processes described above fail to provide satisfactory interlayer effect.