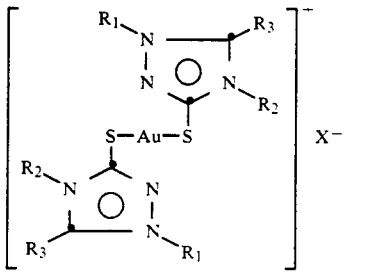
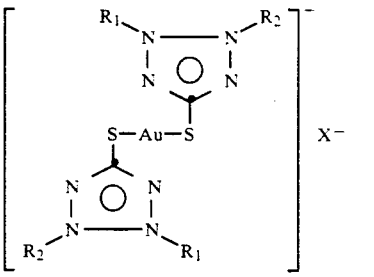
compound coordinates to gold (I) in the novel compounds of the present invention. The exocyclic group f should not be 0 for the present invention since oxygen ligands are not known to form stable compounds with gold (I).

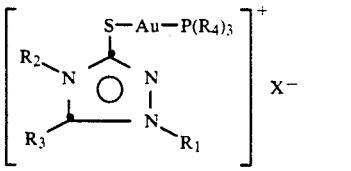
Examples of the gold (I) compounds of the invention are given in the table below. In the structural representations of the gold (I) compounds, the partial charges on the mesoionic ligands are dropped to avoid confusion with the overall charge of the complex ion. The rings symbolizing six delocalized π electrons on the heterocyclic moieties are retained, but will be understood not to imply aromaticity.



Cmpd. No.	R_1	R_2	R_3	X^-
1	CH_3	CH_3	CH_3	BF_4^-
2	CH_3	CH_3	CH_3	I^-
3	CH_3	CH_3	CH_3	Br^-
4	CH_3	CH_3	CH_3	Cl^-
5	CH_3	$CH_2CH{=}CH_2$	CH_3	BF_4^-
6	CH_3	$CH_2CH_2OCH_3$	CH_3	BF_4^-
7	CH_3	NH_2	CH_3	BF_4^-
8	CH_3	C_4H_9	CH_3	BF_4^-
9	CH_3	C_6H_{11}	CH_3	BF_4^-
10	CH_3	C_6H_5	C_6H_5	BF_4^-



Cmpd. No.	R_1	R_2	X^-
11	C_6H_5	C_6H_5	BF_4^-



Cmpd. No.	R_1	R_2	R_3	R_4	X^-
12	CH_3	CH_3	CH_3	CH_3	Cl^-
13	CH_3	CH_3	CH_3	CH_3	BF_4^-
14	CH_3	$CH_2CH{=}CH_2$	CH_3	CH_3	BF_4^-

These novel gold (I) compounds are advantageous over certain other gold compounds containing sulfur known in the art such as trisodium aurous dithiosulfate because the novel compounds do not contain any labile S atoms, thus allowing independent choice and amount of S sensitizer, which is not possible with trisodium aurous dithiosulfate. The flexibility in choice and amount of sulfur sensitizer to be used in photographic emulsion is necessary in some cases to achieve proper gradation, reduced sensitivity to red light, and other sensitometric properties. The compounds of the present invention also are advantageous over other soluble gold(I) compounds which do not contain labile S atoms because the novel compounds have a lower dissociation constant and consequently have better solution stability. Alkyl or aryl thiolates, for example, have a propensity to form polymeric gold(I) compounds with a 1:1 thiolate to gold formula. The compounds of this invention contain discrete gold(I) complexes possessing two ligands. Consequently, the novel compounds have solubility properties which are convenient for dispersion in the emulsion without requiring that a sulfonic acid or other solubilizing group be attached to the ligand. The novel compounds of the present invention also are advantageous over prior art gold(I) compounds in that the preparation and purification of the compounds is very convenient and does not involve potentially explosive material.

The mesoionic compounds L used as starting materials to form the novel compounds with gold(I) may be made by methods described by Altland, Dedio and McSweeney, U.S. Pat. No. 4,378,424 (1983) or by methods described in the review article by Ollis and Ramsden cited above and references given therein. Synthesis of the novel gold(I) compounds can be effected by various techniques known to the art. One convenient method comprises reacting a gold(I) precursor compound with an appropriate amount of the mesoionic compound. In the ensuing reaction, which generally takes place within a few minutes at room temperature (about 20° C.) or slightly above, the ligands of the gold(I) precursor compound are displaced by the mesoionic compounds, which have a higher affinity for gold(I). The product may then be isolated and purified by crystallization techniques.

The various substituent groups on the mesoionic compound modify the solubility of the final product gold(I) compound. The most desired gold(I) compounds are those which are soluble in water and which may be made in water. Those which are soluble in organic solvents such as acetone can still be used to sensitize aqueous emulsions, and can be used to sensitize emulsions in non-aqueous media.

This invention also provides a process for sensitizing a silver halide emulsion formed according to processes generally well-known in the art. A double jet-type process is preferred. The silver halide grains can comprise mixed or single halide components and especially include chloride, bromide, iodide, iodochloride, iodobromide or chlorobromide grains.

The double-jet process comprises adding an aqueous silver nitrate solution and an aqueous solution of one or more halides, for example, an alkali metal halide such as potassium bromide, potassium chloride, potassium iodide or mixtures thereof, simultaneously to a stirred solution of a silver halide protective colloid through two separate jets.

In the present invention, the described sensitizing gold(I) compounds may be added to a silver halide emulsion at various stages during its preparation. For example, the compounds may be added at levels from about 10^{-7} to about 10^{-3} mol thereof per mol of silver halide. A preferred concentration of gold compound to