

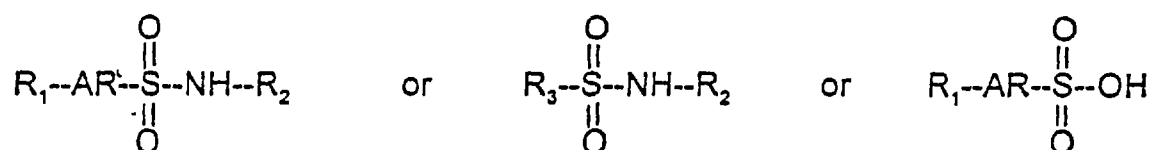


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ABSTRACT OF THE INVENTION

DUCTILITY AGENTS FOR NICKEL-TUNGSTEN ALLOYS

A tungsten alloy electroplating bath. Highly ductile tungsten alloy deposits are facilitated using a sulfur co-depositing ductility additive such as:



wherein R_1 is selected from the group consisting of H, alkyl, alkenyl, hydroxy, halogen, carboxy and carbonyl;

"AR" designates a benzene or naphthalene moiety;

R_2 is selected from the group consisting of H, or an alkyl sulfonic acid, a Group I or Group II salt of an alkyl sulfonic acid, a benzene, a sulfonate, a naphthalene sulfonate, a benzene sulfonamide, a naphthalene sulfonamide, an ethylene alkoxy, a propylene alkoxy; and R_2 may be attached to "AR" to form a cyclic moiety; and

R_3 is selected from the group consisting of a benzene, a naphthalene, an unsaturated aliphatic group; and a benzenesulfonate group.

The additive provides ductility improvements in tungsten alloy electroplates deposited from the solution.



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