



Metal Sulfides (MS_x^{2-})

Properties

Sulfide is an inorganic anion of sulfur with the chemical formula S^{2-} or a compound containing one or more S^{2-} ions. The bonding in transition metal sulfides is highly covalent, which gives rise to their semiconductor properties, which in turn is related to the deep colors. Examples of metal sulfides include CdS, PbS, ZnS, SnS, YS, Cu_2S , MoS_2 , In_2S_3 , Ni_3S_2 , Ag_2S , Na_2S , Bi_3S_2 , SeS_2 , Sb_2S_3 , TiS_2 , FeS_2 , WS_2 , Ni_2FeS_4 , $NiCo_2S_4$, Co-Mo-S, Ni-Fe-Co-S et al.

Plating Solutions

Aqueous solutions of transition metal cations react with sulfide sources (H_2S , NaHS, Na_2S) to precipitate solid sulfides. Electrodeposition of metal sulfides can be performed with the use of soluble sulfur precursors such as $S_2O_3^{2-}$, thiourea, MoS_4^{2-} et al in various solvents. For example, electrochemical depositions of CdS can be performed from different media including aqueous (tartrate, chloride, phosphate, perchlorate, EDTA, alkalis et al), non-aqueous (DMSO, DMF, diethylene glycol, propylene carbonate) ^[1-3] and ionic liquids (methyltributylphosphonium tosylate, choline chloride and urea et al) ^[4]. Plating additives (gelatin et al) are used to stabilize colloidal S ^[5].

Applications

Metal sulfides are used in photocells (CdS, an n-type semiconductor with a band gap of 2.42 eV at room temperature), infra-red detectors (PbS), catalysts (MoS_2), optical devices (ZnS), cosmetic products (SeS_2), hydrogen generation (Co-S, Ni-S, Fe-S, Ni-Fe-S, Co-Mo-S, Cu_2MoS_4 , M- MoS_2) ^[6-9] et al.

References:

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