

Singh and Shrivastava¹⁸ have derived the relative intensity expression as—

$$i = a \left[1 - \frac{3}{2} \left(\frac{2}{\beta} \right)^{1/2} \tan^{-1} \left(\frac{\beta}{2} \right)^{1/2} + \frac{1}{2} \frac{1}{(1 - \beta/2)} \right] \quad (1)$$

where α and β ¹⁹ can be given by $r_s/6$ and $0.814\sqrt{r_s}$, respectively. The interelectronic spacing (r_s) in Bohr radius is determined from plasmon energy. The relative intensities of LEPS of ²³V, ²⁶Fe and ²⁸Ni, according to equation (1), have been calculated and found to be 0.123, 0.203 and 0.106 respectively. These values agree fairly well with those observed by Salem *et al.* (see Table I).

On these grounds, the low energy satellites in $K_{\beta_{1,2,3}}$ X-ray emission spectra of ²³V, ²⁶Fe and ²⁸Ni at energy separations 10.24 ± 1.09 eV, 11.71 ± 1.2 eV and 12.98 ± 1.9 eV respectively are LEPS.

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Department of Physics, S. P. SINGH.
K.N. Government Post-Graduate College,
Gyanpur, Varanasi (U.P.),
January 3, 1978.

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PREPARATION OF DIETHANOLAMINEMANGANATE(III)

REPORTS on metal complexes containing manganese in the tervalent state are very few¹⁻⁵. Maria and Loana⁶ and Edward *et al.*⁷ reported the formation of the manganese(II)diethanolamine complex. Recently Okimoto *et al.*⁸ reported that manganese(III)triethylene-tetramine complex is a powerful initiator of vinyl polymerization. We present here the preparation for the first time of Bisdiethanolaminemanganate(III).

Manganese(II)sulphate monohydrate (0.05 mole) was dissolved in approximately 600 ml of water. Sodium hydroxide (0.10 mole) was added and the precipitate was allowed to settle. The pH of the solution was raised to 9.5 by the addition of 1 ml of 0.01 M sodium hydroxide solution. Oxygen was bubbled through this solution for 1 hour to effect a rapid quantitative conversion of Mn(OH)₂ to Mn(OH)₃. The precipitate of Mn(OH)₃ was filtered transferred to a beaker, 0.10 mole of diethanolamine was added along with 20 ml of ethanol and the mixture stirred well for 1 hour. A red slurry was formed which after washing with ethanol, ether and drying *in vacuo* yielded reddish brown solid. The complex was insoluble in common organic solvents.

Anal : Calc. : Mn, 20.98 ; N, 10.69 ; C, 36.64 ;
H, 6.87.

Found : Mn, 20.88 ; N, 10.62 ; C, 36.43 ;
H, 6.83.

The electronic spectra of the complex in sulphuric acid solution, exhibits a single band at 20,000 cm⁻¹ which can be attributed⁹ to the ⁵T_{2g} ← ⁵E_g absorption expected in an octahedral symmetry. The absence of a band at 3200 cm⁻¹ and above, in the infrared spectra, indicates the absence of any coordinated water or hydroxyl group. The shift of ν(NH) frequency to lower wave number, *viz.*, 3025 cm⁻¹ in comparison to the free ligand¹⁰ (3140 cm⁻¹) indicates the coordination of the diethanolamine through the nitrogen atom.

The thermal decomposition of the solid complex was examined from 70° to 700° C by using a thermo-balance (Perkin Elmer Model TGS-2). The absence of water of crystallisation or loosely bound water was confirmed by the absence of weight loss at about 100° C. The weight loss at about 420°-460° C may correspond to the decomposition of the diethanolamine part and

the formation of MnO_2 . The weight loss at 500°–550° C probably indicates the conversion of MnO_2 to Mn_2O_3 as given in literature. Investigations on vinyl polymerization initiated by this compound are under progress.

Department of Physical
Chemistry,
University of Madras,
A C. College Campus,
Madras 600 025, May 18, 1978.

P. GNANASUNDARAM.
H. KOTHANDARAMAN.

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POLYMETALLIC MINERALISATION IN LADAKH GRANITE, INDUS SUTURE ZONE, LADAKH, INDIA

THE present note records, for the first time, polymetallic sulphide and titaniferous-magnetite mineralisation in Ladakh Granite batholith which runs parallel to the Indus Suture Zone, Ladakh, India¹⁻².

Preliminary field investigations carried out in the area by one of the authors (K. K. S.) suggest structural doming of the Ladakh Granite between Upshi and Kiari in the east and Khalsi and Garkon in the west, where the Indus river has carved deep narrow valleys, exposing the core portion of the batholith.

The polymetallic sulphide mineralisation is mainly restricted to the pink porphyritic granite near Hanu, west of Khalsi, whereas the titaniferous-magnetite mineralisation is confined to the leuco-granite, occupying the core zone of the Ladakh batholith near Gaik, east of Upshi³⁻⁴. The mineralisation in the former seems to be quite promising and occurs in the form of veins along fractures and shear zones and as thin films along smooth joint surfaces in the granite.

On the basis of the microscopic studies the following ore minerals have been identified: chalcopryrite,

chalcocite, pyrite, galena, malachite and azurite. Reflectance measurements made on these ore samples also suggest the presence of native copper and palladium (?).

Two grab samples were picked up from a 30 cm thick mineralised vein striking NW-SE near Hanu. Preliminary chemical analyses on these samples have yielded 10.2% and 9.6% Pb; 1.6% and 3.6% Cu, respectively.

In the light of the available data on the known mineral occurrences from subduction zones, the world over, it is expected that such zones may yield polymetallic mineralisation. The geological observations in a part of the Indus Suture Zone of Ladakh area indicate the presence of ophiolitic melange and blue schist facies metamorphism which have supported Gansser's earlier contention that the Indus Suture Belt represents a subduction zone⁵⁻⁸. The present discovery of polymetallic mineralisation in the Ladakh Granite has a special bearing as this confirms to the idea that suture zones are prospective zones of polymetallic mineralisation. It is possible that such zones of subduction may have been repeated in space and time during the long history of the Himalayan Orogen. This phenomenon confirmed by the detailed geological investigations, being carried out by the Wadia Institute of Himalayan Geology, would not only throw light on the nature of such zones, but may lead to the discovery of new mineral deposits of economic importance in the Indus Suture Zone.

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Wadia Institute of
Himalayan Geology,
Dehra Dun 248 001, July 4, 1978.

KEWAL K. SHARMA.
K. R. GUPTA.

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