Plate I

Mica-schist showing joints exposed in railway cutting near Sanvorde

Photo 1

Quartzitic intercalations in mica-schist near Sanvorde

Photo 2

Segregation pegmatite in granite gneisses near Kakommardi.

Photo 3
Plate II

Photo 1
Phyllites showing small scale folding near Salgini.

Photo 2
Shear zone traversing lithomarge in Anvali Dongor mine, Rivon.

Photo 3
Angular fragments of chert cemented by manganese oxide and slickensiding along the shear zone in Anvali Dongor mine, Rivon.
Plate III

Relict pockets of lithomarge in wad in Anvali Dongor mine, Nivon.

Photo 1

General view of the Erka mine, Natravli.

Photo 2

Faulting as seen in Shutanbai mine, Verlen.

Photo 3
Plate IV

Photo 1  A cavity along fault plane partially filled with manganese ore in Gonishirem mine, Verlem.

Photo 2  Bands of lithomarge in wad showing minor folding in Narutigad mine, Verlem.

Photo 3  Crushed and brecciated folded phyllites from Ghattsimaddi mine; also show slight displacement along the shear zone.
Plate V

A vein of asbestos in a metabasic rock near Netravali.

Pebbles of quartzite in mica-schist exposed near Sanvorde.

Ellipsoidal quartzite pebbles with schistose matrix in metaconglomerate exposed near Sanvorde.
Plate VI

Photo 1  Concretions of manganese ore in lateritic ore.

Photo 2  Spheroidal bodies of manganese oxide formed in cavities. White patches are of chert.

Photo 3  Botryoidal bodies showing radiating needles in cross section.
Plate VII

Stalactites formed in openings and cavities in shear zones. Photo 1

Outer side of a geode showing onion skin structure made of folia of manganese oxides. Photo 2

Inside of a geode filled by cavernous manganese oxides as well as by crystals of manganese oxide. Photo 3
Plate VIII

Photo 1  Box work structure shown by ores in lateritic zone.

Photo 2  Banded structure; the bands are of manganese oxide and silica.

Photo 3  Columnar structure with elongated cylindrical and tapering rod like bodies.
Plate IX

The rod like bodies of a columnar structure in cross section show a radial arrangement of needles from centre towards the margin.

Photo 1

Breccia with angular fragments of chert cemented by manganese oxides.

Photo 2

Stalactitic growths in cavities in brecciated ores.

Photo 3
Plate X

Photo 1 Lamprobolite from metabasics showing replacement by tremolite and actinolite.

(Pol. light x50)

Photo 2 Relicts of lamprobolite left in tremolite-actinolite. Replacement halo is also seen.

(Nicols crossed x50)

Photo 3 Porphyroclasts of quartz embedded in a matrix of quartz and sericite.

(Nicols crossed x25)
Plate XI

Gases in metagreywacke (lower) filled with colloidal silica showing banding.  
(Nicols crossed x50)

Plagioclase showing replacement by microcline in granite gneiss  
(Nicols crossed x90)

Intergrowth between quartz and plagioclase forming myrmekitic structure in metadolerite  
(Nicols crossed x90)
Photo 1

Early formed plagioclase included in later formed pyroxene crystals in gabbro.

(Nicols crossed x30)

Photo 2

Interpenetration twins of plagioclase in gabbro.

(Nicols crossed x70)

Photo 3

Vesicular intergrowth of ore and antigorite formed by alteration of olivine in gabbro.

(Pol. light x50)
Plate XIII

Intergrowth between braunite and jacobsite
Braunite stained dull grey, unstained greish white is jacobsite and dark is psilomelane.
(Pol. light x80)

Photo 1

Euhedral crystals of jacobsite in a matrix of braunite and psilomelane.
(Pol. light x65)

Photo 2

Crystals of pyrolusite exhibit fracturing due to chemical brecciation.
(Nicob crossed x55)

Photo 3
Photo 1  Aggregate of prismatic crystals of manganite in a matrix of gangue.
          (Pol. light x80)

Photo 2  Selective replacement of pyroclusite (dusty dark grey) by prismatic manganite crystals with pyramidal terminations forming a stelate arrangement.
          (Pol. light x60)

Photo 3  Pyroclusite (light grey) fractured; the fractures are filled with nsutite (?)
          (Pol. light x45)
Plate XV

Symmetrically banded veins; bands near the walls and central portion are of psilomelane (dark grey), while intermediate bands are of pyrolusite (light grey). Symmetrical bands on two sides are of coarse and medium grained aggregate of pyrolusite (light grey).

(Nicols crossed x50)

Photo 1

Symmetrical banding. Centre is filled with quartz (black); on either sides of quartz there is pyrolusite (light grey) which is succeeded by dusty looking grey psilomelane.

(Fol. light x55)

Photo 2

Symmetrical banding. A vein is filled with quartz and on either sides of quartz there is felted mass of pyrolusite (light grey). The vein cuts through a matrix of psilomelane (dark grey), replaced by pyrolusite.

(Nicols crossed x55)

Photo 3
Plate XVI

Photo 1  Irregular fragments of gangue are surrounded by layers of psilomelane and quartz (dark).
         (Pol. light x55)

Photo 2  Fragments of goethite (grey) surrounded by layers of psilomelane (light grey).
         (Pol. light x75)

Photo 3  Angular fragment of gangue (dark) surrounded by a layer of psilomelane (dusty grey); around this layer there is a zone of radiating prismatic crystals of pyrolusite.
         (Pol. light x60)
Plate XVII

A vein produced by fracture filling at different intervals. The fillings represent the banded vein in the centre with coarse prismatic crystals of pyrolusite on the two sides. The wall of the vein on the right is made of fine to medium grained pyrolusite.

(Nicol’s crossed x40)

A veins of pyrolusite (light grey) traversing the matrix of gangue and psilomelane giving rise to an anastomosing pattern.

(Fol. light x60)

Goethite (grey) deposited around quartz (dark) is fractured and the interstices between the grains are filled with pyrolusite (light grey).

(Fol. Light x45)
Plate XVIII

Photo 1  The interspaces of the irregularly fractured quartz (grey) have been filled with pyrolusite (light grey).

(Pol. light x65)

Photo 2  Fractured grains of pyrolusite (light grey) and grains of quartz embedded in a matrix of psilomelane.

(Nicola crossed x55)

Photo 3  Colloform structure with alternate bands of quartz and psilomelane.

(Pol. light x55)
Plate XIX

Alternate colloform bands of pyrolusite (light grey), goethite (grey) and quartz (dark) showing zig-zag outlines. The centre is filled with pyrolusite in which small inclusions of quartz are seen. The colloform bands are displaced by later fractures. (Pole light x45)

Photo 1

A reniform body shows colloform banding. The bands are made up of pyrolusite (light grey), quartz (dark) and goethite (grey). The central portion of the cavity is occupied by quartz and goethite. Radiating cracks formed due to syneresis are also seen. (Pole light x55)

Photo 2

A cavity with lining of colloform bands zig-zag in nature. The upper half of the cavity is filled with pyrolusite (light grey) surrounded with goethite (grey), while in the lower half pyrolusite, quartz and goethite form a complex aggregate. (Nics crossed x50)

Photo 3
Plate XX

Photo 1  Spheroidal body showing alternating colloform bands of quartz (dark) and pyrolusite (light grey). The outer surface shows botryoidal form while the centre is occupied by gangue.

(Pol. light x55)

Photo 2  Spheroidal body showing colloform banding has been fractured and distorted due to inter-mineralization fracturing.

(Nicols crossed x40)

Photo 3  Colloform structure showing botryoidal bodies. The bands are replaced from outside by radiating crystals of pyrolusite.

(Nicols crossed x55)
Plate XXI

Colloform structure veined by younger pyrolusite; the veins are of segmented type.

(Nicol's crossed x55)

Aggregate of pellets whose outer rims are made of tiny crystal aggregates of pyrolusite.

(Nicol's crossed x50)

Ellipsoidal pellets, with partial development of inner bands. They show replacement from outside by neutite(\(^\)°)

(Pol. light x60)
Plate XXII

Photo 1  Shrinkage cracks in psilomelane formed due to dehydration.
          (Fol. light x45)

Photo 2  Spheroidal body of pyrolusite showing concentric and radial shrinkage cracks.
          (Fol. light x60)

Photo 3  Shrinkage cracks radiating outward from a central core in pyrolusite.
          (Fol. light x55)
Plate XXIII

Matrix of psilomelane (dusty dark grey) showing replacement by pyrolusite grains, seen in different extinction positions.

(Nicola crossed x55)

Metacrysts of pyrolusite (light grey) with relics of psilomelane in them. Dark grains are of pyrolusite in extinction position.

(Nicola crossed x55)

Metacrysts of pyrolusite (light grey) coalesce by growth to form an aggregate, in which unreplaced relics of the host are retained.

(Nicola crossed x45)
Plate XXIV

Photo 1
Matrix of psilomelane (dark grey) showing replacement by fine needles and metamict crystals of pyrolusite (light grey) with irregular boundaries.

(Pol. crossed x65)

Photo 2
Selective replacement of bands of pyrolusite (dusty grey) by tabular crystals of manganite.

(Pol. light x70)

Photo 3
Spheroidal bodies replaced by crystals of manganite (light grey), arranged perpendicular to the boundary of the body, leaving in the core relict islands of psilomelane (dark grey).

The matrix of pyrolusite (stained black) is also partially replaced by manganite.

(Pol. light x50)