भारत सरकार
GOVERNMENT OF INDIA
खान मंत्रालय
MINISTRY OF MINES
शैलिकी प्रभाग / Petrology Division
भारतीय भूवैज्ञानिक सर्वेक्षण / Geological Survey of India
दक्षिण क्षेत्र / Southern Region
बैंडलागुडा / Bandlaguda
हैदराबाद / Hyderabad-500068

No. 2611/TCS/GSI/Pet/EPMA/SR/2025 Date: 26/11/2025

Petrographic report

.

Sender details

K. Nageswar Rao, Director (G), PR & Corordination,
Critical mineralTrackers,
Hyderabad

Madam,

Please find the attached petrographic report on submitted samples (22 nos.) for your perusal.

Thanking you,

Yours sincere

K. Basak
(Dr. KRISHNAPRIYA BASAK)
कृष्णप्रिया बसाक / KRISHNAPRIYA BASAK
निदेशक / Director
क्षेत्रीय मुख्यालय / Regional Headquarter
भारतीय भूवैज्ञानिक सर्वेक्षण / Geological Survey of India
दक्षिणी क्षेत्र, हैदराबाद / Southern Region, Hyderabad-500 068

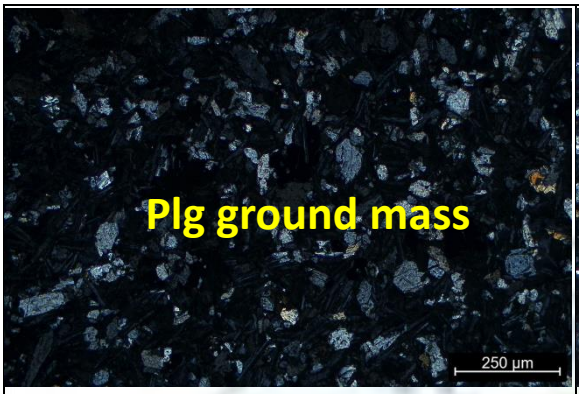


Fig. 2C. Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (10X).

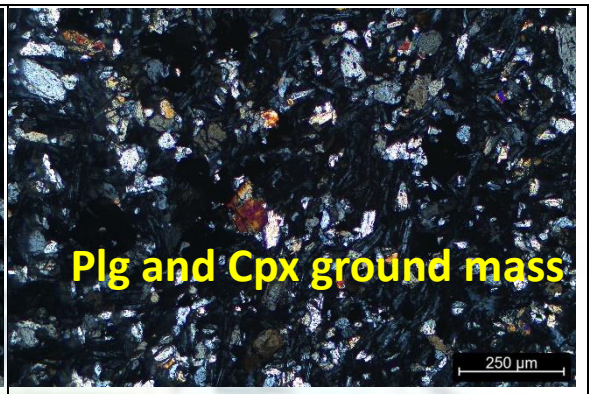


Fig. 2D. Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (10X).

3. Sample code: NB/TS/P14

Microscopic observations:

Microscopic study reveals that the rock displays a medium- to coarse-grained texture, with grain diameters ranging from approximately 250 to 750 micrometers. Grains are poorly sorted, and both angular and subrounded quartz grains coexist, which together indicate rapid deposition or minimal transport. Grain boundaries are irregular, and the grains commonly exhibit point and long contacts, consistent with mechanical compaction during burial. It predominantly shows quartz grains (Qz), which are abundant.

. Quartz is present as subrounded to angular grains, indicating moderate transport prior to deposition. The presence of plagioclase feldspar (Plg) is signifying a minor but crucial feldspathic component, possibly derived from nearby igneous or metamorphic source rocks. Biotite (Bt) is observed. Its occurrence, though infrequent (Fig. 3A-3D).

The study reveals a minor matrix in the form of fine material occupying the intergranular spaces. The degree of visible cementation appears limited, with quartz overgrowths not clearly observed, suggesting that grain-to-grain contacts dominate over load-supporting cement. The matrix may include clay or altered feldspar, contributing to a minor muddy texture.

The prevalence of quartz points to a mature sandstone. The small proportion of plagioclase feldspar and biotite suggest limited compositional maturity or proximity to a mixed igneous-metamorphic provenance. Minimal matrix and cement, along with angular grains, indicate limited diagenetic alteration.

Overall, the study illustrates a quartz-rich, subarkosic sandstone, characterized by poor sorting and angular grains. Such features are indicative of fluvial or proximal alluvial depositional environments, with limited transport and moderate source rock diversity.

Rock/Mineral Name: Based on the mineral and textural characteristics, it is a Sandstone.

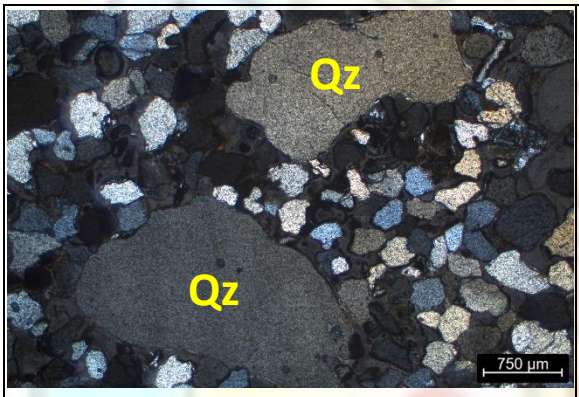


Fig. 3A. Photomicrograph showing presence of different grain size of quartz(Qz) under transmitted light XPL (2X).

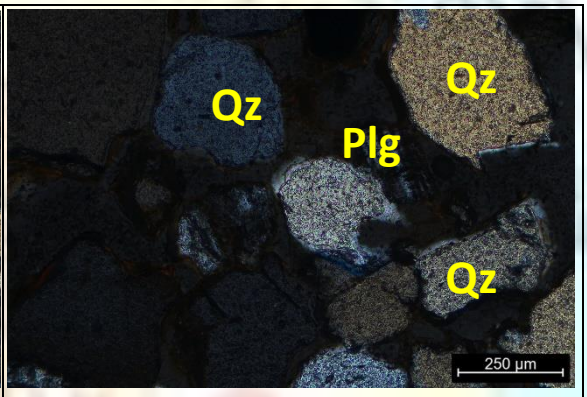


Fig. 3B. Photomicrograph showing presence of quartz(Qz) and plagioclase (Plg)under transmitted light XPL (10X).

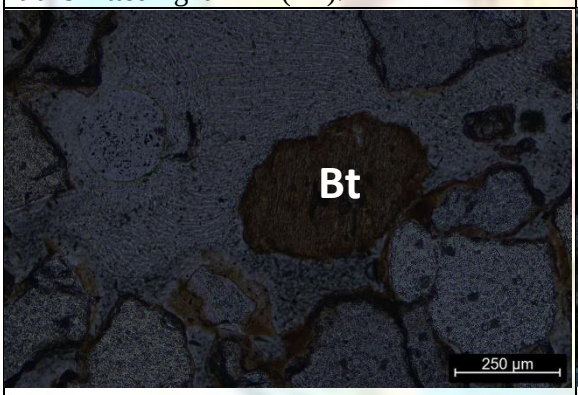


Fig. 3C. Photomicrograph showing presence of Biotite (Bt) under transmitted light XPL (10X).

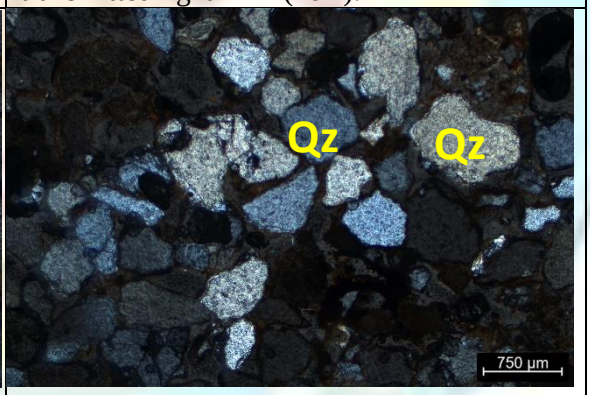


Fig. 3D. Photomicrograph showing presence of different grain size of quartz(Qz) under transmitted light XPL (2X).

4. Sample code: NB/TS/T5

Microscopic observations:

Microscopic study reveals that the rock exhibits a medium to fine grain size. The grains display angular to subangular outlines, indicating limited transport and deposition relatively close to their source. Poor sorting is observed, with variable grain sizes and shapes, suggesting rapid sedimentation possibly by fluvial processes or short transport mechanisms.

Quartz (Qz) is overwhelmingly the dominant mineral phase, showcased by its abundance across rock. The presence of multiple quartz grains, with some displaying undulatory extinction typical of detrital quartz. Plagioclase feldspar (Plg) appears minorly and is identifiable by its characteristic polysynthetic twinning, which suggests an input from igneous or metamorphic source terrain. Additionally, microcline (Mc) is noted, recognized by its cross-hatch twinning, reflecting a granitic provenance. Biotite (Bt) is present as elongate laths and contributes accessory (Fig. 4A-4D).

The dark areas in the photomicrographs correspond to matrix material, likely composed of fine-grained clay or altered rock fragments, signifying a minor but present muddy fraction. Visible evidence of cementation is limited, with intergranular contacts prevailing, indicating a predominately clastic-supported framework with minimal authigenic growth.

The dominant quartz content, combined with the presence of feldspar (both plagioclase and microcline) and biotite, classifies the sandstone as subarkosic to arkosic, suggesting a mixed provenance from felsic igneous and accessory metamorphic sources. Its textural immaturity and mineral diversity indicate deposition close to uplifted and unweathered continental or metamorphic-igneous terrains, most likely within fluvial or proximal alluvial environments where rapid sediment supply and limited reworking dominate.

Rock/Mineral Name: Based on the mineral and textural characteristics, it is a Sandstone.

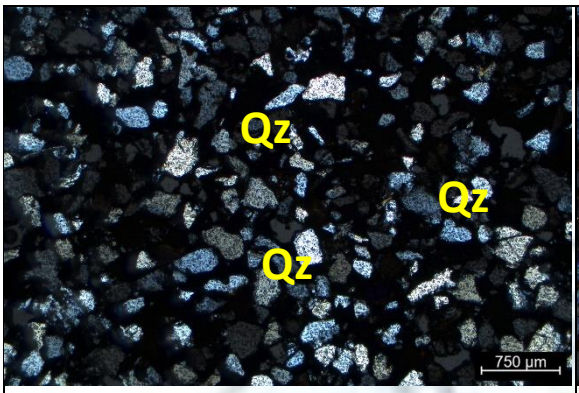


Fig. 4A. Photomicrograph showing presence of different grain size of quartz(Qz) under transmitted light XPL (2X).

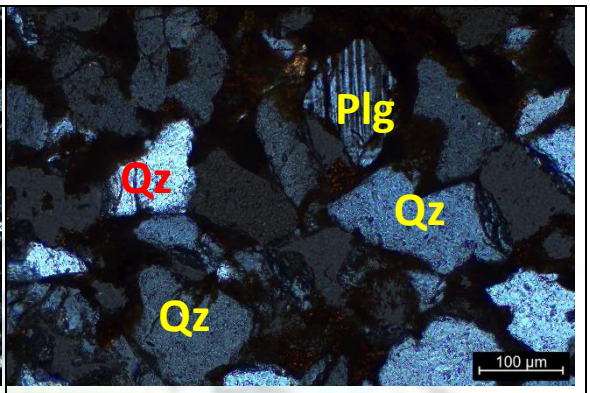


Fig. 4B. Photomicrograph showing presence of quartz(Qz) and plagioclase (Plg)under transmitted light XPL (10X).

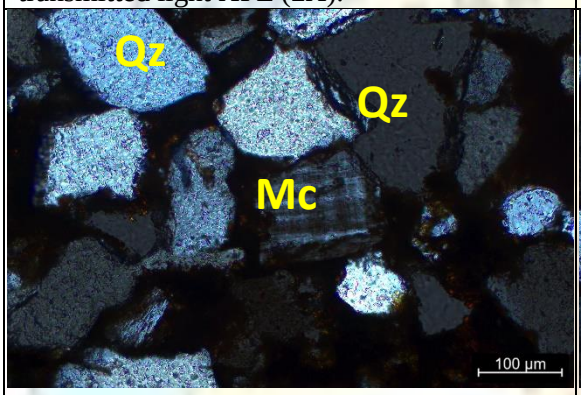


Fig. 4C. Photomicrograph showing presence of quartz(Qz) and microcline (Mc)under transmitted light XPL (10X).

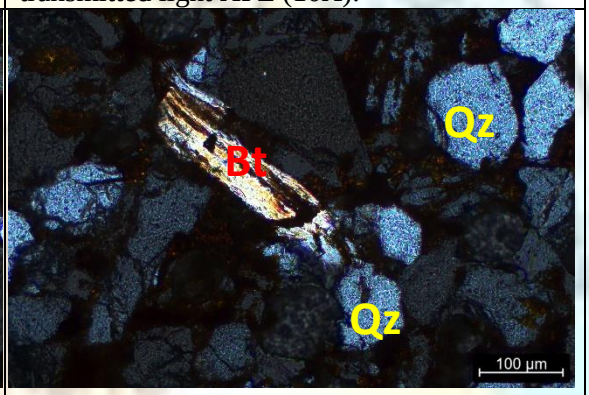
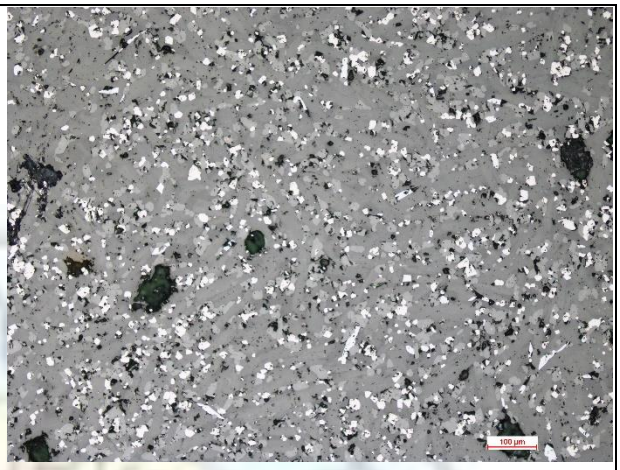


Fig. 4D. Photomicrograph showing presence of quartz(Qz) and biotite (Bt)under transmitted light XPL (10X).

5. Sample code: RB/TS/P20

Microscopic observations:

Microscopic study reveals that the rock shows iron oxide minerals dominate these photomicrographs, imparting a pervasive reddish-brown to yellowish hue throughout the rock. Hematite and goethite (Gth) are visible, with goethite showing its characteristic yellow-brown pleochroism and earthy appearance (Fig. 5A-5B). These iron oxides and hydroxides are major constituents of lateritic profiles, forming from the intense chemical weathering of source rocks. Calcite (Cal) is also present as secondary mineralization in discrete patches and vein-like fillings, distinguishable under cross-polarized light by its strong birefringence (Fig. 5C-5D).

	
Fig..21.7 Brown and orange brown coloured glass in the interstitial spaces	Fig.21.8 Tiny magnetites disseminated in the basaltic matrix

22. Sample no. NB/TS/P-06

Mineral Assemblage: Quartz + Feldspar + Mica + Rock fragment + Cherty fragment as framework mineral

Cement: Hematite and magnetite

Texture: Microscopic study reveals that the rock displays a medium- to coarse-grained texture, with grain diameters ranging from approximately 250 to 750 micrometers. Grains are poorly sorted and are angular to subrangular in shape indicating rapid deposition and minimal transport. Grain boundaries are irregular, and the grains commonly exhibit point and long contacts, consistent with mechanical compaction during burial. The rock predominantly consists of quartz grains as framework minerals. Quartz grains are mostly angular, indicating moderate transport prior to deposition. The presence of plagioclase feldspar and microcline is suggestive of igneous source rocks and minimum transportation. Few Mica grains are also present. Two rock fragments of varying size are noted viz., cherty rock fragment and quartzite fragment both indicating metasedimentary provenance. Undulose extinction in quartzite rock fragment also suggest similar provenance.

The rock is extremely cemented by ferrugious material such as hematite and magnetite. At places detrital frameworking grains are volumetrically much less than the ferruginous cement and grains are not in contact. Few magnetite occur as detrital frameworking grains.

Name of the Rock: Ferruginous sandstone

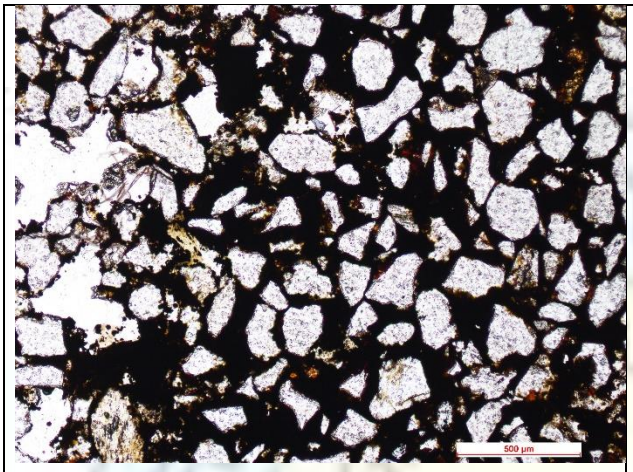


Fig. 22.1 Angular to subangular quartz grains and few mica as detrital material cemented by ferruginous material.

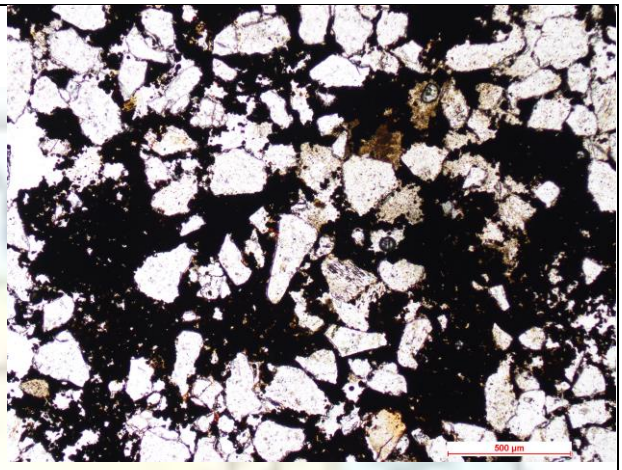


Fig. 22.2 Ferrugenous cement dominated part where angular to subangular quartz grains floated in cement

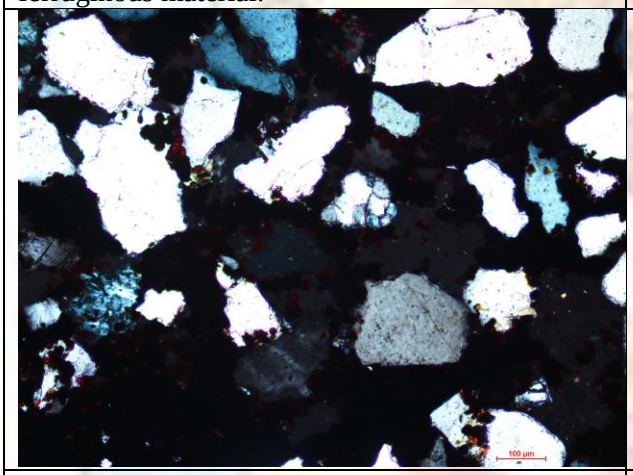


Fig. 22.3 Presence of rock fragment and feldspar indicate less weathering and minimal transport

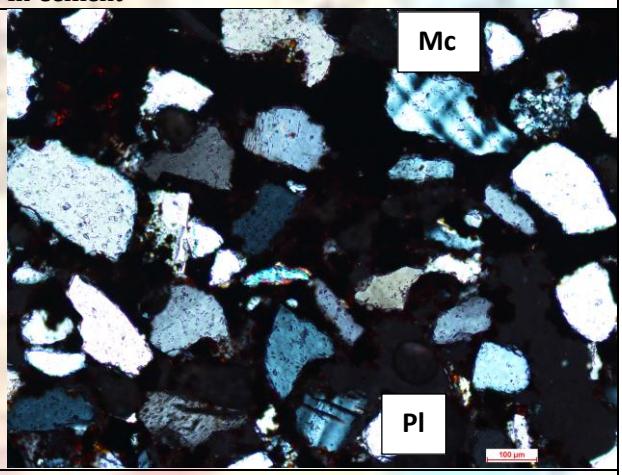


Fig.22.4 Microcline (Mc) and plagioclase (Pl) as frameworking mineral indicating igneous provenance.

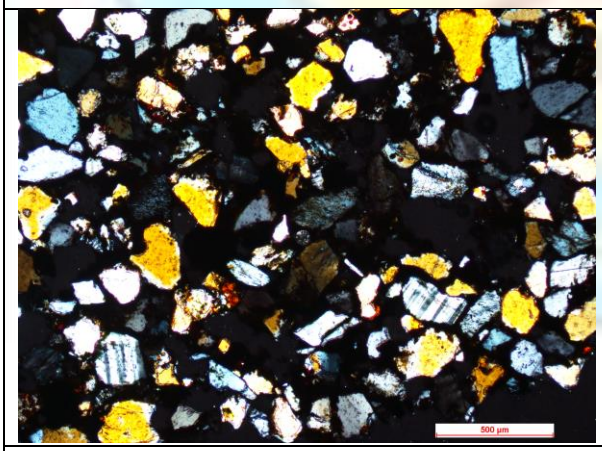


Fig. 22.5 Feldspar and quartz under X polarized light

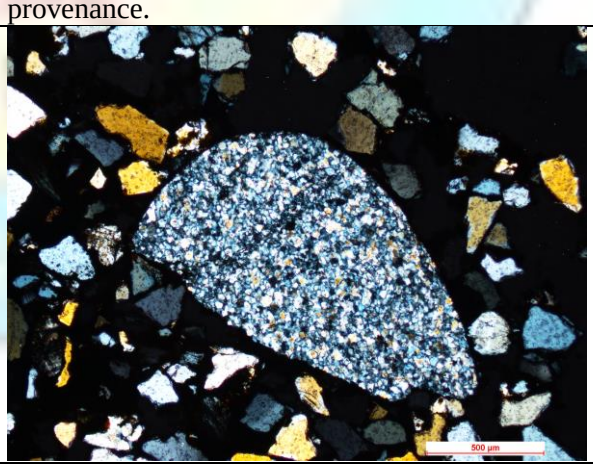


Fig. 22.6 Cherty fragment in quartzose frameworking grains

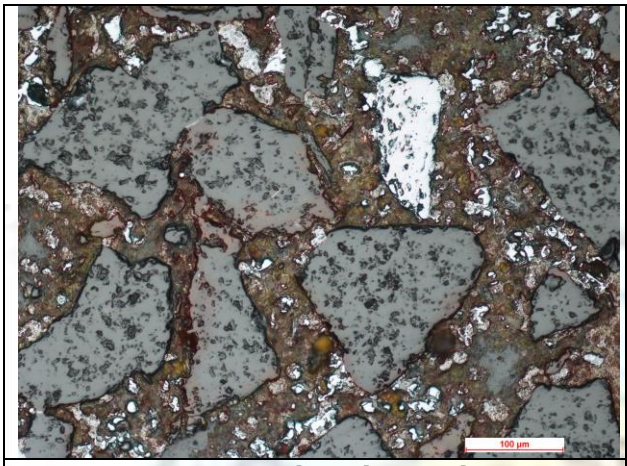


Fig. 22.7 Magnetite as detrital mineral; ferruginous cement; under reflected light

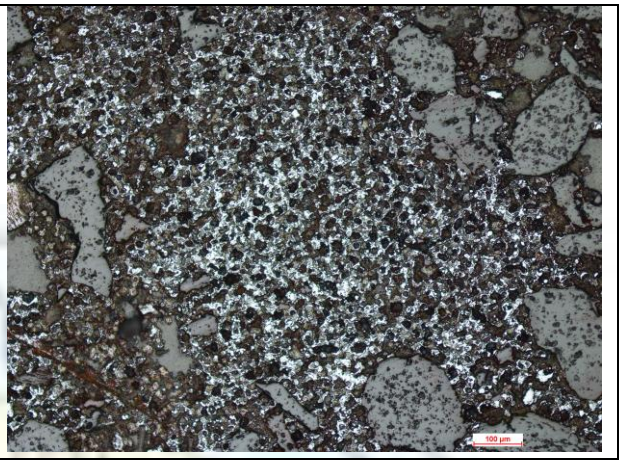


Fig. 22.8 ferruginous and magnetite rich cement; under reflected light

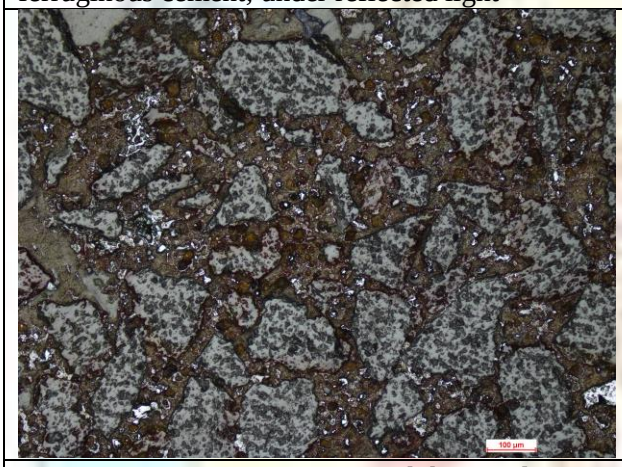


Fig. 22.9 Ferruginous cement and the angular quartz grains; under reflected light

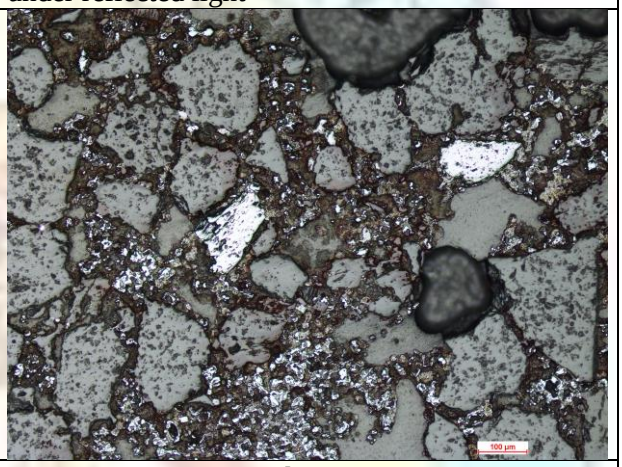


Fig. 22.10 Hematite and magnetite as cementing material; detrital magnetite grains along with angular quartz grains

Studied and Report prepared by:

(Sri Srinavasa Rao Baswani)
Senior Geologist

(Dr. Krishnapriya Basak)
Director

Checked by

(Dr. Krishnapriya Basak)
Director