WA.6609/7-1.4(5)

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REPORT TITLE/ TITTEL

PETROGRAPHY AND MINERALOGY OF
WELL 6609/7-1 FROM 1942.5 m to 1968.5 m

CLIENT/ OPPDRAGSGIVER

PHILLIPS PETROLEUM, att.: R. Rogers

RESPONSIBLE SCIENTIST/ PROSJEKTANSVARLIG

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SUMMARY/ SAMMENDRAG

Samples from an interval between 1942.5 m to 1968.5 m of well 6609/7-1 have been found to be a metamorphic quartz-muscovite-K-feldspar schist, a conclusion based upon petrographical and mineralogical criteria.

KEY WORDS/ STIKKORD

6609/7-1

Petrography

Quartz-muscovite K-feldspar schist

G27/o/1/ams

INTRODUCTION AND METHODS

7 thin-sections and polished slabs from the interval 1942.5 m to 1968.5 m of well 6609/7-1 have been examined at our laboratory. The investigations were first undertaken on a Leitz Ortholux polarizing microscope and secondly on a Jeol 733 superprobe with a Tracor Northern EDS/WDS computerized analytical system. SEM/EDS analyses were performed on three of these thin sections. The samples were coated with carbon, enabling chemical analysis of elements equal to and higher than sodium in atomic number. A combination of x-ray, Cathodo-luminescence, and backscattered electron-images gave valuable information on the different phases involved.

TEXTURES

The tectures are metamorphic with mosaic growth and embayed to curved grain-boundaries in the quartz-rich and quartz-feldspar-rich layers and straight grain-boundaries between muscovite crystals.

MINERALOGY

The mineralogy of this schist, i.e. quartz + muscovite ± K-feldspar, is stable over a wide range of metamorphic grades, from very low grade lower grade, and mediumgrade metamoprhism. By going from mediumgrade to higher grade of metamorphism, quartz and muscovite will react to give Al_2SiO_5.

Quartz is the most abundant in all the thin sections investigated. Primary clastic grains are not observed except for a very low contrast between core and rim observed with the cathodo-luminescense detector in sample 1968.5 m.

Muscovite is found as euhedral to subhedral crystals both in thin layers parallell to the schistosity and as scattered crystals in quartz-rich layers. It contains small amounts of iron and titanium. We often find kaolinite with the muscovite, this is supposed to be due to deep weathering (retrograde reaction series) of the rock.

Feldspar. There are to types of feldspar. One, the most abundant, is a potassium feldspar, the other which is found only in small amounts in sample 1942.5 m is an albite.

Carbonates. Calcite with small amounts of iron is observed both interstitial and as a secondary product on cracks. Siderite is found only on cracks as euhedral microcrystals.

Pyrite, zircon, and apatite are found in minor amounts.

CONCLUSION

The rock is a quarz-muscovite schist with feldspar-rich layers, and is probably of sedimentary origin, i.e. of primary arcosic composition.

Fig. 1 Backscattered electron image (BEI) of sample 1945.90 m showing banding of muscovite (Mu) (+kaolinite (K)), and quartz (Q) parallell to the foliation. 1 cm = 100um.

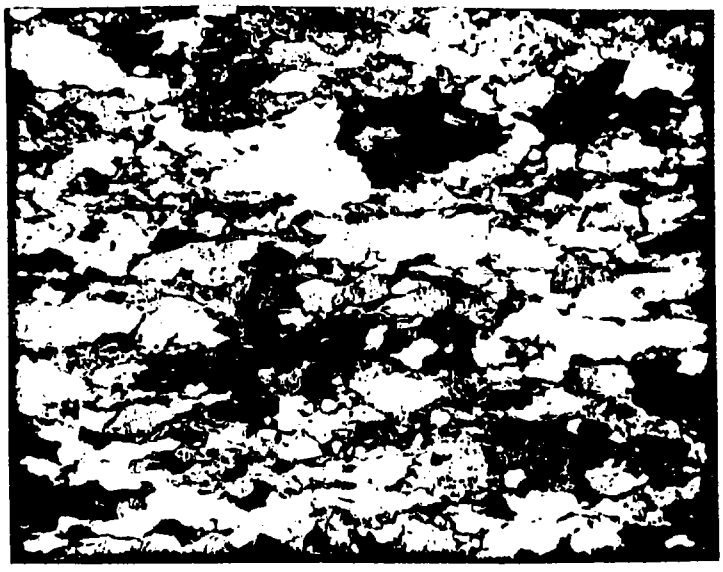

Fig. 2 Quartz-mosaic texture with embayed grain boundaries. Note the dimensional growth of crystals. Sample 1945.90 m. 1 cm = 160um.

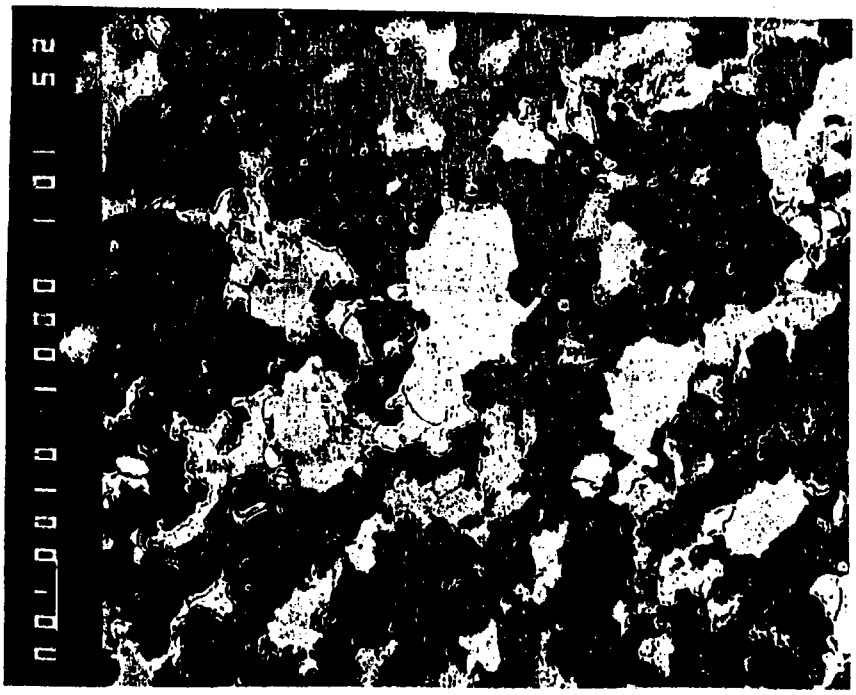

Fig. 3 BEI which shows the textural relationship between quartz and feldspar in sample 1962.5 m. Q=quartz, F=feldspar, Cc=calcite, Mu=muscovite, and Z=zircon. (1 cm = 100um).

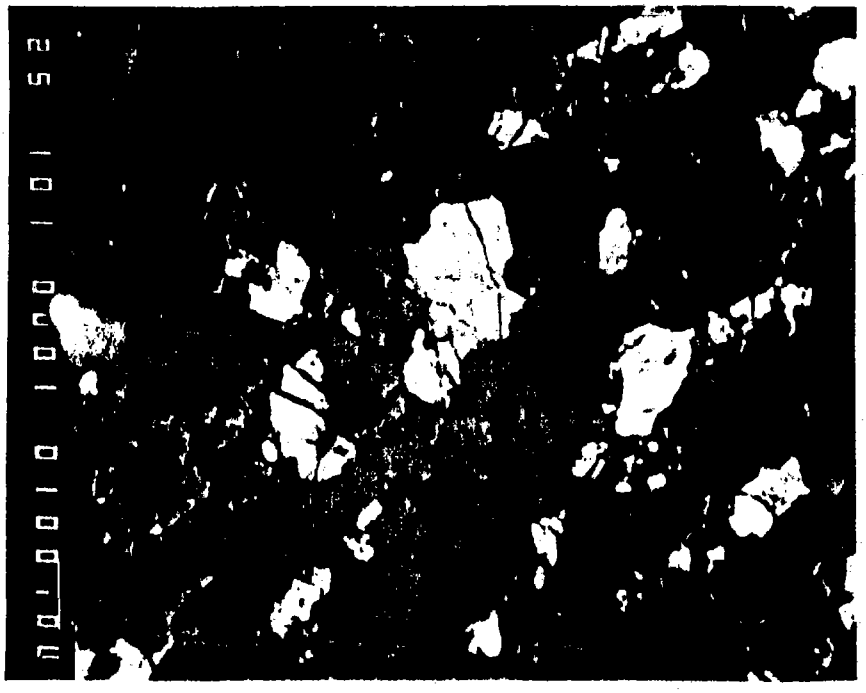

Fig. 4 The same area as above, but a cathodoluminescense image. The bright crystals are K-feldspar. Note the fracturefill which is not seen in the above picture due to amentation. (1 cm = 100um).

Institutt for kontinentalsokkelundersøkelser
CONTINENTAL SHELF INSTITUTE
Geology department

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CLIENT: PHILLIPS PETROLEUM CO.   WELL NO.: 6609/7 – 1

ENCLOSURE: 1

STRATIGRAPHIC LOG   SCALE: 1:500

BY: V.Fjerdingstad, M.Løfaldi, H.Selnes, J.Verdenius

Depth: 350 – 1968.5 (TD) m
Water depth: 257 m
Lat: 66°24'56,48"N
Long: 09°01'14,91"E
Casing depths:
30" : 348 m
20" : 1024 m
13 3/8" : 1833 m

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LEGEND

Clay/claystone; Shale; Carbonaceous claystone; Marl; Silt/Siltstone; Sand/Sandstone; Gravel/Conglomerate; Limestone/Chalk; Dolomite/Siderite; Gypsum, anhydrite/Salt; Tuff, Lava; Coal; Cement; Additive (LCM, lignosulphonate etc.); Crystalline basement; Conglomerate with pebbles of quartzite and schist.

Cored interval; SWC - SWC - no recovery; Unconformity; No sample coverage or undated; Top significant occurrence; Bottom significant occurrence; Occurrence; Peak occurrence

OCCURRENCE: Abundant; Common; Present

Acritarchs; Botryococcus; Coal; Chamosite; Glauconite; Ironstone; Mica; Monotypic Assemblage; Pyrite; Macrofossils; Foraminifera; Plant fossil; Roots; Spicules; Shell fragments; Bryozoans; Ostracodes; Dinoflagellates; Spores; Bioturbation; Chert; Ooides; Sphaerosiderites; Cross bedding; Calcite cemented calcareous; Dol cemented dolomitic; Sid cemented sideritic

COLOUR ABBREVATIONS	
lt	light
dk	dark
gy	grey
brn	brown
gn	green
olv	olive
yel	yellow
orng	orange
red	red
blu	blue
wh	white
blk	black
purp	purple
pk	pink

GRAIN SIZE ABBREVATIONS	
cl	clay
slt	silt
vf	very fine
f	fine
m	medium
c	coarse
vc	very coarse

CLAYSTONE COLOURS	DEPTH	CORES/SIDEWALL CORES	SIDEWALL CORE LITHOLOGY	CUTTING AND CORE LITHOLOGY	GRAIN SIZE	STAGE/AGE	ZONE	SYSTEM/PERIOD	ENVIRONMENT (Deep Marine, Shallow Marine, Non Marine; PALYNOLOGY; MICROPALAEONTOLOGY: Bathyal, Outer Neritic, Inner Neritic, Littoral, Non Marine)	ADDITIONAL SPECIFICATION ON ENVIRONMENT	ENVIRONMENTAL INDICATORS & STRATIGRAPHIC MARKERS	COMMENTS, REMARKS AND FOSSIL TOPS

Depths: 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1050, 1100, 1150, 1200, 1250, 1300, 1350, 1400, 1450, 1500, 1550, 1600, 1650, 1700, 1750, 1800, 1850, 1900, 1950, 1968.5

Casing: 30" (350), 20" (1024), 13 3/8" (1833)

Stage/age: PLEISTOCENE (350–620); 620–640; LATE PLIOCENE (640–1060); EARLY PLIOCENE (1060–1460); 1460–1465; No sample; EARLY EOCENE (–1510); 1510–1525; PALEOCENE (1525–1620); 1620–1635; CAMPANIAN (1635–1840); 1840–1845; CENOMANIAN – ALBIAN (1845–1872.5); 1872.5; 1920

System/period: QUATERNARY; TERTIARY; CRETACEOUS; PERMIAN; INDETERMINATE

Claystone colours: gy; greyish grey; grey; grey; greyish green; lt gn; grey; dark grey; grey; grey/brownish grey; lt gn; lt gn; grey; grey

Additional specification on environment: HIGH ENERGY; BOTTOM CIRCULATION GOOD; RESTRICTED BOTTOM CIRCULATION

Environmental indicators: common sapropel; common Machystridium increasing amounts of wood particles

Comments, remarks and fossil tops:
- E.GROENLANDICUM
- E.EXCAVATUM
- C.RENIFORME / C.OBTUSA / N.LABRADORICUM
- S.LOEBLICHI
- N.LABRADORICUM / S.LOEBLICHI
- S.SCHLUMBERGERI / M.COMMUNIS
- C.GROSSA / T.FLUENS
- E.BARTLETTI
- E.HANNAI
- BOLIVINA SP.1
- G.PUNCTICULATA / U.HOBIUS/VENUSTA
- 'C' CARAPITANA / 'R' MULTICAMERATA / FORAMS OF BROWNISH COLOUR
- COSCINODISCUS SP.1 BETTENSTAEDTI
- SPHAERICAL RETICULATA RADIOLARIA
- COMMON COSCINODISCUS SP.1
- S.POROSUS
- D.OPERCULATA / D.CLADOIDES / CHATANGIELLA SPP / C.DISTINCTUM / S.CLAVUM
- C.DELTANICA / S.DELITIENSE / APTEODINIUM SP
- AQUILAPOLLENITES
- K.GOCHTII / DINOGYMNIUM SP / P.PHRAGMITES
- P.INFUSOROIDES / S.CAMPANULUM / H.PULCHRUM
- D.ANTHOPHORUM / L.SIPHONIPHORUM
- BRYOZOA IN DOLOMITE CUTTING FRAGMENTS: TREPOSTOMATA, FENESTRATA