DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO.83/10
PETROLOGY OF THREE KAOLIN-RICH ROCK SPECIMENS, CULTANA AREA

GEOLOGICAL SURVEY

by

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FEBRUARY, 1983

DME. 82/82

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Rept. Bk. No. 83/10
DME No. 82/82
Disk No. 22

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ABSTRACT

Three specimens of kaolin-rich rocks from the Cultana area were examined. One specimen is distinguished by cross-bedded, highly angular quartz and is probably Adelaidean in age. Identification of the other two specimens is uncertain.

SADME PET REP 1/82 7-12-82

Cultana 1:100 000 area

1:50 000 Sheet 6432-III 6432 RS 72, 76, 127

Request by Dr. A.P. Belperio to determine whether Adelaidean rocks are included among three kaolinised specimens.

Specimen 6432 RS 72. Thin section C 38052

Rock name Kaolinised siltstone.

Locality Stony Point liquids pipeline trench. 590.396 km from Moomba; 11 km W of Port Augusta.

Hand specimen

The rock is a fine-grained, pink to yellow-green claystone with silty, cross-bedded laminae marked by iron oxide staining.

The rock is dense in comparison with the other two specimens. It resembles a description of altered Tregolana Shale in Crawford and Forbes, 1969.

Thin section

The rock is seen in thin section to contain considerably more quartz than is apparent in hand specimen. The grains are

highly angular, often elongated, and mainly show a strict orientation. Cross-bedded bands are lenticular.

Flakes of muscovite are moderately abundant and also show a strict orientation. They tend to be altered and iron stained.

The bulk of the rock is composed of clay minerals which are not reliably identified optically owing to the pervasive iron oxide staining. The clay fraction is identified by X-ray diffraction as kaolinite.

Iron oxide occurs as irregular patches and as a general brown staining. The oxide is particularly abundant in coarser quartz-rich bands and along bedding planes.

Comment

The siltstone was deposited under moderately strong current action from rapidly abraded and transported detritus. The high clay content may be wholly or in part due to kaolinisation of felspar or lithic fragments but may be original. On balance the evidence suggests that the rock is probably Tregolana Shale, or Adelaidean in age.

Reference

Crawford, A.R. and Forbes, B.G., 1969. The Geology of the Cultana 1:63 360 map area. Rep. Invest., geol. Surv. S. Aust. No. 34.

Specimen 6432 RS 76. Thin section C 38053.

Rock name Kaolinitic clay.

Locality Creek bank, Sunman Deposit. 12 km SW of Port Augusta.

Hand specimen

The rock is a soft, finely laminated white clay with a low specific gravity.

Thin section

In thin section the fabric of the clay does not appear to be oriented. Quartz grains lack the elongation and preferred orientation of the quartz in specimen S 72 and the clay minerals are randomly oriented.

Quartz grains are generally equidimensional and fine in grain size. However, occasional coarse grains are present.

The clay minerals are more coarse-grained than those in specimen RS 72, probably the result of growth by replacement in place. Flakes of highly birefringent minerals are still present within a mass of clay with low birefringence. These are probably relict fragments of muscovite and its intermediate alteration product, illite. The clay with low birefringence has been identified by X-RD as kaolinite. The mica flakes display an imperfect preferred orientation.

Comment

The petrographic evidence identifies the specimen as a highly kaolinised rock with a relict orientation marked by mica flakes. The rock may originally have been a member of the Tregolana Shale, possibly with most of any original quartz dissolved out by alkaline solutions. However, the possibility of a redistribution of Adelaidean sediment into Tertiary or Recent lake deposits cannot be ruled out on petrographic evidence. Palynological evidence may be more significant in this respect. There is no evidence of organic forms in the section examined. Impregnation by solutions carrying halite, which was identified by X-RD, may have occurred in the decomposed rock in place.

Specimen 6433 RS 127. Thin section C 38054.

Rock name Kaolinised silty clay.

Locality Stony Point liquids pipeline trench, 584.35 km from Moomba; 8 km NW of Port Augusta.

Hand specimen The specimen is a white, kaolinitic clay with fine silty laminae.

Thin section

Lithologies consisting of both fine clay with very little quartz and quartz-rich, coarser grained clay minerals are represented in the thin section as distinct sedimentary bands.

The fine-grained facies contains well-oriented clay minerals of moderate birefringence, probably montmorillonite, and a scattering of fine sericitic muscovite. The birefringent minerals stand out in a background of almost non-birefringent kaolinite. The few quartz grains include both irregular but equidimensional forms and sharply angular and elongated forms. The latter are generally well-oriented.

The coarser grained facies also contains quartz, relict muscovite, birefringent clay and kaolinitic clay. The quartz is both equidimensional and elongated. Grain boundaries are often embayed by corrosion. The mica flakes are generally altered and display a preferred orientation. The coarse grains of clay minerals have a fibrous structure, often with a radiating habit. They are almost certainly the products of recrystallisation in place.

Comment

Despite strong evidence of corrosion and replacement, the specimen still displays clear sedimentary features. However, the environment of deposition was different from that of specimen RS 72. Current action was much less energetic and suggests a lacustrine or lagoonal environment. If such sediments are within the range encompassed by the Tregolana Slate the specimen is probably Adelaidean in age.

However, the possibility of redistribution into more recent lakes could not be ruled out on petrographic evidence. The absence of organic forms may be significant in this respect. The trace of gypsum identified by X-RD is not diagnostic of age and could have originated at any time.

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