LATERITES OF NELLORE, ANDHRA PRADESH

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AN area of about 400 sq. miles between Tada (66 C/2 ; 13° 35′ : 80° 2′) in the south and Singarayakonda (66 A/4 ; 15° 13′ 45″ : 80° 1′ 45″) in the north was mapped with particular reference to the nature of laterites and their extent in relation to the underlying rocks. Mapping has been facilitated by the numerous fresh sections of laterite and the underlying rocks exposed in the railway cuttings along the new double line on the Madras-Calcutta route.

Laterites in the Nellore area are of two types.

(*i*) Fresh, *in situ* laterite quarried as building stone is porous, pitted and clay-like, usually yellowish-brown in colour with slight pinkish tinge. The same rock when exposed for a long time acquires a hard protective crust of limonite and becomes dark. The rock shows elongated cavities. It is often pisolitic and cemented by ferruginous material. This does not contain pebbles. The thickness of the laterite varies from 3 to 30 feet. Usually adjoining the above and sometimes overlying it are laterites which are just cemented, hard, ferruginous pebble gravels. Their maximum thickness is about 6 feet. The pebbles are usually subrounded or oval and range in diameter from 5 to 25 mm. The matrix is ferruginous.

(*ii*) The second type is undoubtedly very recent in age and is made up of pebble gravels shining reddish-brown in colour and occasionally mixed with small pieces of vein quartz and yellowish-brown sand. Microsections of the ferruginous gravels do not show any concretionary texture. In the area under investigation these occupy a large portion to the west of the main massive laterites. Where sections of the loose lateritic gravels are exposed they overlie granite gneisses, the two sometimes being separated by gravels of kankar, which is locally used for the manufacture of lime. It is of interest to note that palæolithic implements made out of vein quartz are found among these gravels in many places. This horizon also contains numerous subrounded to rounded cobbles and these and the enclosing materials look like channel fillings. The thickness of this horizon is usually around 3 feet.

King[1] was the first geologist to map the sedimentary formations of Nellore area between N. Lat. 13° 30′ and 15° 0′ Bruce Foote[2] mapped the same formations further north up to Krishna River. A comparison of the two maps shows some anomalies at the junction between the two areas, which was pointed out even by King (p. 67). Bruce Foote included in his *Lateritic Formations* both the types of laterites mentioned above, whereas King's *Cuddalore Sandstones* (p. 67) includes the first type of laterite, since according to him it is the Cuddalore sandstone that has been ultimately altered to the massive laterite. The second type was described by him under 'Lateritic Deposits' (p. 71).

During the recent survey it was noted that the laterite is invariably underlain by granite gneisses, hornblende gneisses, quartzites and quartz schists, or garnetiferous gneisses. No section was seen in which the laterite is underlain by sandstone. Within the laterites near about the transition from the underlying gneisses, ramifications of veins of pegmatites, with the felspar (altered) and quartz are seen in many sections, as for example in a railway cutting one mile south of Bitragunta (57 N/14 ; 14° 46′ : 79° 59′). It is seen that some of the gneisses look like felspathic sandstones, but in sections exposing more than 30 feet of these rocks, as in a place 2½ miles north of Tettu (66 A/4 ; 15° 2′ 50″ : 80° 0′ 15″), the change from the gneisses to the laterite through the weathered gneisses, looking like felspathic sandstone, is clearly seen. In a few places like Rosanur (57 O/13 ; 13° 50′ 20″ : 79° 54′ 15″) and Damavaram (57 N/14 ; 14° 42′ 5″ : 79° 57′ 50″) the longer diameter of the cavities in the laterites are parallel to the foliation direction of the underlying gneisses pointing to their derivation from the gneisses. In the lateritic quarries about a mile south of Nellore (57 N/15 ; 14° 27′ : 79° 59′) stray pieces of rock resembling gritty sandstones are sometimes met with but no clear sections showing them in place are seen. On the other hand, quartzites and gneisses along with quartz veins are seen jutting out of the laterites in the above quarries. In all likelihood the gritty nature of a few of the laterites could be due to the extensive occurrence of massive vein quartz and quartzites immediately west of the lateritic patches; the detrital quartz might have been derived from those rocks and embedded in the laterite.

In the Rajahmundry area the gradual change from the Rajahmundry sandstone (stratigraphically equivalent to Cuddalore sandstone) to the laterite is clearly seen in many sections.[3]

Laterites are seen capping Cuddalore sandstones east of Neyveli in Madras State, and similar material is found at Tanjore and to its south, continuing into Pudukotta. It is undoubtedly due to the lateritisation of the Tertiary sandstone. But from the available evidences in the Nellore area it is inferred that the laterites here are derived from the underlying gneisses and not from any sandstones. King (p. 68), however, does mention a few occurrences of laterites over gneisses in this area. The presence of laterite over almost every type of rock is known from different parts of India and hence it is not unlikely that the laterites of Nellore area are the altered product of the gneisses. Fox's[4] description of laterites of Malabar and Kanara which are derived from gneisses and granites is applicable to those of Nellore area also as both are of the same type and have been derived from gneissic rocks.

It is therefore concluded that the so-called Cuddalore sandstones' of King *in the Nellore area* are only laterites derived from the gneisses and are the same as the ***Lateritic Formations*** of Bruce Foote. It is possible that the Nellore area was not submerged during the Tertiary era and therefore does not possess any sandstones similar to those at Cuddalore, Neyveli, Tanjore and other places.

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1. King, W., *Mem. G.S.I.*, 1880 (Reprinted 1930), **16** (2), 109 (Reprinted pp. 1–86).
2. Bruce Foote, R., *Ibid.*, 1879 (Reprinted 1930), **16** (1).
3. Vaidyanadhan, R., Unpublished M.Sc. Thesis, Andhra University, 1953.
4. Fox, C. S., *Rec. G.S.I.*, 1936, **69**, 389.

COLOUR OF AMAZONITE

POTASH feldspar used in ceramic industry has a colour commonly varying between different shades of red, though grey and white varieties are also known. Sparsely, there occurs a green or blue-green variety, the amazonite, which has acquired a certain currency as a semiprecious stone because of its beautiful green colour. Pure potash feldspar that is heated until it melts forms a white mass, independently of the original colour.

Explanations of the cause of colours of feldspars are usually based on plausible assumptions. Thus the reddish colour of potash feldspar is attributed to the trioxide of iron, Fe_2O_3, which is present as an impurity. At the smelting of the feldspar Fe_2O_3 is partly reduced to the divalent oxide FeO which dissolves in the feldspar glass causing a green colour. The feldspar melt then changes to white. This theory of the sequence of events is quite well-founded for many types of feldspar, and the described process explains why a whiter feldspar porcelain is obtained if suitably chosen reducing conditions are a part of the firing process.

In analogy with the above theory it has been assumed that divalent iron oxide FeO should be the cause of the amazonite's green colour. The green colour is also sometimes attributed to the presence of small quantities of copper or chromium oxide.

F. Sandford and J. A. Hedvall of the Chalmers University of Technology, as a result of some systematic investigations, have proposed a new explanation for the green colour of amazonite, namely, that it is due to disturbances in the lattice structure. Sandford and Hedvall carried out the following experiments on amazonite from a Swedish deposit, Skantrop in the Isle of Orust: (*i*) Heating in the temperature range 20–1200° C. in atmospheres of air, nitrogen and hydrogen, (*ii*) Spectroscopic examination for establishing possible presence of copper and chrome oxide, (*iii*) determination of loss of weight on ignition, (*iv*) differential thermal analysis, and (*v*) X-ray investigation of the colour varieties obtained at different temperatures.

As a result of the above tests, the authors find that the traditional explanation of the various colour varieties of potash feldspar, *i.e.*, they should be caused by colouring oxides of iron, copper, or chromium, cannot be correct in the case of the amazonite examined. On the other hand, there are excellent reasons, they contend, for assuming disturbances in the lattice may constitute a contributory cause. It is known that feldspars generally contain small quantities of chemically linked water the presence of which in the lattice may give rise to colour-changing effects. According to this explanation the pink colour of the naturally occurring feldspars would indicate that they have been formed under conditions that have permitted its lattice to attain a high degree of perfection.—(*Trans. Chalmers University of Technology, Sweden*, 1962, No. 257.)