

Fairbairn and Kapoor (1959) observed that the germinating seedlings do not show presence of any alkaloids in the radicle. By detailed anatomical studies they observed that the laticiferous vessels in which the alkaloids reside appear in the seedlings only when the cotyledons open but the alkaloids are detected after the first two leaves have come out. They concluded that the leaf, and not the roots, is the site of synthesis of alkaloids in *P. somniferum*. These findings were confirmed by ascending paper chromatographic technique they employed in the detection of alkaloids.

These observations confirm the general conclusion for Solanaceous plants that the site of synthesis of alkaloids in the case of *Physochlaina preleata* and *Datura innoxia* is the root. But in the case of *Papaver somniferum* it is the leaf and not the root where the alkaloids are synthesised.

Regional Research Laboratory, L. D. KAPOOR.
Jammu, February 15, 1963.

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DIPOLE MOMENT OF DYES

THE dipole moments of two dyes have been determined in three different solvents, benzene, toluene, and xylene. The dyes used are, (i) waxoline yellow ADS which consists of two substituents of aniline and dimethylaniline connected by N—N linkage and (ii) a complex dye waxoline rhodamine B.S. The dielectric constant was determined by the beat frequency oscillator. The crystal oscillator had a frequency 3202.5 k.c./sec.

The molar polarization of the solute for infinite dilution was determined by graphical extrapolation and the electronic polarization was calculated by the method of least squares. All the observations were taken at 30° C.

The dipole moments of the dyes are given in Table I.

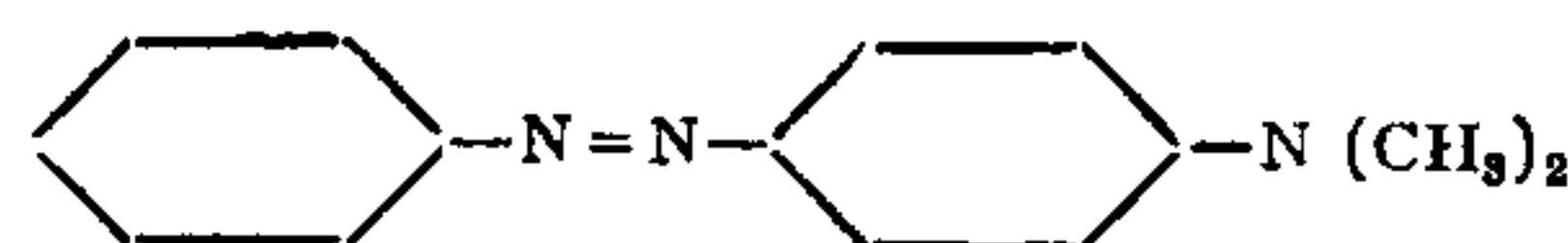
The dipole moments are observed to be in decreasing order from benzene to toluene and xylene.

The authors wish to thank the Imperial Chemical Industries, India, Ltd., for supplying the dyes used in this work.

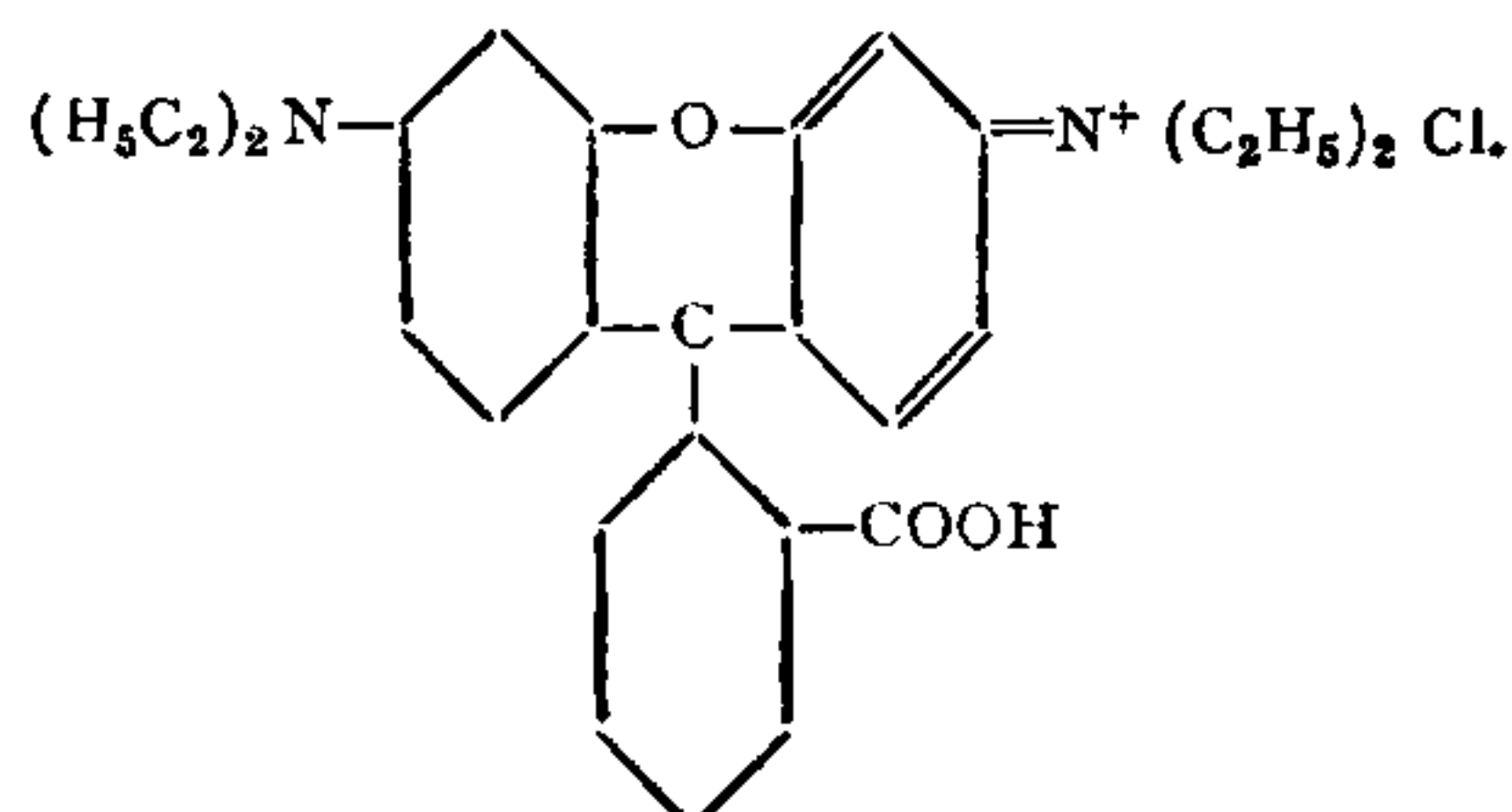
TABLE I
Dipole moments of Waxoline Yellow ADS and Waxoline Rhodamine B.S. in three different solvents

Solute	Dipole Moment (Debye units) in		
	Benzene	Toluene	Xylene
Waxoline Yellow ADS ..	2.82	2.72	2.62
Waxoline Rhodamine B.S. ..	5.68	5.47	5.37

Formulae of two dyes :



Waxoline Yellow ADS



Waxoline Rhodamine B.S.

Purity of two dyes is 99.99% as the commercial samples were purified by dissolving them in benzene and using the filtrate for repurification. The residue from the samples was found to be about 10%.

K. J. Somaiya College, D. D. DESAI.
Bombay-77.

Khalsa College, N. H. PANDHARE.
Bombay-19, February 22, 1963.

ARGILLISATION AND WALLROCK ALTERATION AT MOSABHONI COPPER MINES, SINGBHUM DISTRICT, BIHAR

VARIOUS studies of hydrothermally altered rocks from mineralised horizons have been made to establish criteria to guide exploration and location of new ore-bodies. Considerable attention has been bestowed to such studies elsewhere. The purpose of this study in the Mosabhoni Copper Mines is to investigate if any such criteria exist here. Several specimens were collected from various levels for this study.

The general approach made during this study is similar to the one given by Creasey,¹ who

envisaged a threefold facies of hydrothermal alteration, which are (i) prophyllitic facies consisting predominantly of montmorillonite, epidote, clinozoisite, chlorite and kaolinite, (ii) argillic facies represented by such minerals as chlorite, kaolinite and illite and (iii) potassium silicate facies consisting of muscovite, hydromica, sericite, recrystallized biotite and tourmaline. The threefold division was revised into a two-fold one by Burnham² which consists of argillic and phyllic facies.

The following three zones could be delineated in the Mosabhoni Mines: (i) a foot wall zone consisting predominantly of montmorillonite, epidote, clinozoisite, chlorite and kaolinite characteristic of the prophyllitic type; (ii) a central zone with chlorite, kaolinite and illite and (iii) followed on the hanging wall side by a zone of muscovite, hydromica, sericite, recrystallized biotite and pinkish and bluish-green tourmaline.

X-ray studies have revealed the presence of montmorillonite, chlorite (pinninite variety with unit cell dimensions C-axis 14.15 Å, B = 97°, $a = 5.3$, $b = 9.20$), kaolinite (7.10 Å to 7.15 Å), illite (10.00 Å) and biotite (phlogopitic). Montmorillonite is predominant in the foot wall side and kaolinite attains maximum development in the central zone of the comparatively more intensely sheared and altered sodagranite. Illite is predominant in the mineralised horizons, and also in areas of intense alteration.

The derivation of a variety of alteration products was indicated when the complex mineral biotite is subjected to hydrothermal agencies at moderate temperatures and pressures. The different stages of biotite alteration were studied. The normal brown biotite frequently alters to a feebly brown or green variety, then to green chlorite and finally to illite. This is borne by optical, chemical and X-ray studies. The results are given in Table I.

TABLE I

	C-axis	Ref. index	Total Iron %
1. Primary brown biotite	.. 10.40	1.690	12.30
2. Faded brown biotite	.. 10.16	1.550	6.85
3. Green chlorite	.. 10.10	1.520	4.45
4. Illite	.. 10.00	..	Traces

Two varieties of secondary muscovite after biotite were noticed, which are (i) perfect or nearly perfect pseudomorphs of colourless mica after biotite and (ii) flaky or fibrous pseudo-

morphs. Besides this, unusual occurrence of biotite being partly replaced by tourmaline was also noticed. Development of epidote and zoisite in biotite is characteristic of the prophyllitic facies of the first zone. Elimination of titanium and iron from biotite takes place during its alteration with the development of pyrite and chalcopryrite. The combination of sulphur with the released iron from the biotite alteration seems to favour the formation of pyrite and chalcopryrite.

Hypogene nature of the clay minerals is suggested by the following observations: (i) Supergene oxidation of sulphides is slight even at the surface samples. Abundant primary sulphide minerals including pyrite, arsenopyrite, pyrrhotite and chalcopryrite are found at the surface without any alteration; (ii) the argillised zones (900 to 2,600 feet below the surface) that are now being investigated lie beneath the water-table; (iii) the amount of argillisation increases with the mineralisation; and (iv) spectrochemical analyses³ show similarities in the trace element content of the altered minerals and clay minerals in all respects, but there is a marked difference between the trace elements of the unaltered minerals and the altered minerals (including clay minerals).

From the above, the temperature range of ore solution during mineralization and argillization seems to be 400° to 450° C., with a change from acidic to alkaline medium as evidenced by the development of montmorillonite and zeolites. It may be concluded that reliable guides to the occurrence of the ore bodies are, (i) highly sericitised zone in association with maximum fracturing and tensional dilation, (ii) the prevalence of copper content⁴ above 300 p.p.m. with nickel and cobalt contents of 50 p.p.m. and 20 p.p.m. respectively and lastly (iii) the presence of traces of molybdenum.

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Geology Department, K. KAMESWARA RAO.
Andhra University, G. S. R. KRISHNAMURTY.
Waltair, February 5, 1963.

* Indian Agricultural Research Institute, Pusa, New Delhi.

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OCCURRENCE OF KHONDALITE FROM THE EXTRA-PENINSULAR REGION CHOR AREA, HIMACHAL PRADESH

PILGRIM AND WEST¹ after a detailed mapping of the rocks of the Simla hills arrived at the conclusion that the Chor granite mass is an intrusive in the Jutogh rocks and that these granites are all of Archæan age. The granites came into existence before the deposition of the Chail series. According to these authors, the granite intrusion was contemporaneous with the recumbent folding and metamorphism and that the Jutogh rocks are the oldest rocks of the area. The sequence of events as established by them is as follows :

11. Cross-faulting and warping of the overthrust planes ;
10. Main overthrusting with low grade metamorphism ;
9. Folding in of the Subathu with Jaunsar, Simla and Blaini series ;
8. Deposition of the Subathu series ;
7. Deposition of the Simla to Krol series ;
6. Deposition of Chail and Jaunsar series ;
5. Intrusion of olivine dolerites soon after the intrusion of Chor granites ;
4. Intrusion of Chor granites towards the end of recumbent folding and regional metamorphism ;
3. Recumbent folding and regional metamorphism ;
2. Intrusion of basic sills and dykes (now hornblende schists) ;
1. Deposition of Jutogh series.

The rock types so far reported from the Jutogh series of the Chor area are : quartz schists, quartz-mica schist, biotite-muscovite schist, garnetiferous-mica schists, staurolite schists, chlorite and chloritoid schists, slaggy and pitted carbonaceous slates and schists, quartzites, crushed and banded dolomitic marbles generally carbonaceous and often containing actinolite, carbonaceous phyllites often garnetiferous, hornblende schists, amphibolites, Chor gneissose granite and olivine dolerites and a few pegmatites.

It may be interesting to record that neither kyanite nor sillimanite have ever been reported

from the area¹ (p. 68). However, we have found besides the rocks enumerated above, the rocks of the granulite facies, viz., graphite-sillimanite schist, graphite sillimanite gneiss and corundum-bearing schist from the area around the town of Rajgarh ($30^{\circ} 51' : 77^{\circ} 18'$), about 3 miles towards the east. The graphite-sillimanite schists and gneisses have been identified with the Khondalites of the Peninsular India. The rocks are highly crushed at places. It is interesting to mention that at certain places the carbonaceous graphite-sillimanite schists are outcropping in immediate contact with the chlorite schists which belong to the green schist facies. In view of this abnormal association, it would not be wrong to infer that the contact between the two might be a tectonic contact and the graphite-sillimanite rock has been thrust over the chloritic schist. The carbonaceous series with the khondalitic rock might be a separate series by itself, and different from the other carbonaceous rocks occurring interbedded with Jutogh schists, quartzites and marbles, etc.

Besides the above, we have found evidences of migmatization on a regional scale.

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Department of Geology, M. N. SAXENA.
Panjab University, R. C. KANWAR.
Chandigarh, February 22, 1963.

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THERMAL ANALYSIS OF ALTERED ROCKS FROM VEMPALLE LIMESTONE BELT, CUDDAPAH SYSTEM

VEMPALLE limestone belt is hydrothermally altered in the vicinity of basic intrusions. Asbestos and steatite are the two end-products of such alteration. These two minerals occur in different zones of alteration, but not together, though they are similar in chemical composition. In order to identify the intermediate products of alteration leading to the final formation of asbestos in one case and steatite in another, differential thermal analysis of these altered rocks was carried out.

Samples were collected from three places, showing hydrothermal alteration, in the neighbourhood of Mutchukota ($77^{\circ} 52' 38'' ; 14^{\circ} 51'$), Anantapur District, Andhra Pradesh. Steatite is the end-product at two places, one near Singanaguttapalle ($77^{\circ} 48' 39'' ; 14^{\circ} 53' 40''$) on the western flank of a small hillock and the