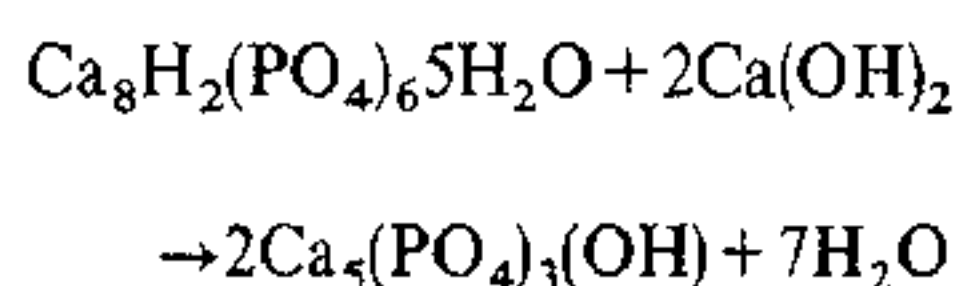


Table 1. Results of the products of hydrolysis of octacalcium phosphate.

Time (min)	Wt% Ca	Wt% P	Ca/P g atom ratio
0	33.06	19.14	1.30
10	36.07	20.92	1.32
20	38.05	19.14	1.49
30	37.57	17.67	1.61
90	38.57	17.67	1.63
150	38.57	17.67	1.63
240	38.85	17.67	1.65

results of hydrolysis of OCP is given in Table 1. The apatitic composition was attained after 30 min P(Ca/P = 1.60) which progressively increased to 1.65 at 4 h. Since the hydrolysis was done in the reaction medium containing a surplus of Ca ions in solution, the reaction taking place during hydrolysis can be represented as:



This is supported by the fact that *in vivo*, the tissue fluids contain a high concentration of calcium, which are essential for secretion of parathormone and continual osteoclastic resorption of bones. This calcium participates with the hydrolysis of OCP to hydroxyapatite of bone *in vivo*.

The electron micrographs in Figure 1, indicates the changes in the morphology of the crystals during different stages of hydrolysis. In the first stage of hydrolysis (Figure 1b), an interesting growth of hexagonal crystals of HAP are seen on the OCP structure. In Figure 1c, the host OCP contained more number of small crystallites of HAP. At the end of 4 h, distinct rod like crystals characteristic of crystalline HAP are seen in the micrograph (Figure 1d). This indicated the morphological changes of OCP from blade-like habit to rod-like habit of HAP after conversion. Since the lattice energy of a hexagonal structure of HAP is more than the weak structure of OCP, the formation of stable HAP crystal^{10, 11} are thermodynamically favoured and the lattice of less stable OCP is ruptured along the faces about which the HAP crystals grow during hydrolysis.

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Rose colouration of muscovite in rose mica schists from Manbazar-Gopalnagar, Puruliya district, West Bengal, Eastern India

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Rose coloured mica schists occur as small lensoid bodies in colourless mica schist of Manbazar-Gopalnagar areas. The rose colouration of these mica schists is imparted by muscovites which show distinct pleochroism in shades of rose colours. The rose colour of the muscovites is inferred to be due to their higher MnO content than the colourless muscovites.

The precambrian rocks between Manbazar (23°4'N, 86°40'E) and Gopalnagar (23°8'N, 86°35.6'E), belonging to Chotanagpur terrain, Eastern India, are composed of a WNW-ESE running belt of mica schists with bands and lenses of amphibolites, greenschists (quartz-chlorite-epidote schists), quartzites, gondite and calc-silicate rocks. Rose mica schists occur in many localities (about 1.4 km north of Jitujori, 1.7 km SSE and 1.4 km south of Gopalnagar, 1.25 km north-east of Shyampur and 0.25 km south of Amakocha) as small patches and lenses, few metres to 20 m in length, within the dominant non-rose mica schists of usual silver grey or light colours¹. The small quarry (20 × 10 m) to the south of Amakocha is composed dominantly of rose muscovite schists containing thin lenticular concordant patches of usual silver/grey muscovite schists. The intensity of rose colour of the rose muscovite schists varies from place to place in the same exposure, ultimately grading to usual silver/grey muscovite

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schists. The present paper deals with the cause of rose colour of muscovite of these rose mica schists.

Mode (vol%) of a typical rose muscovite schist from 0.25 km south of Amakocha (sample 63) is: quartz 46.4, rose muscovite 37.9, biotite 1.6, opaques 8.3, piedmontite 1.9, alkali feldspar 3.5, apatite 0.4, garnet trace. Rose muscovite grains occur as strongly oriented, occasionally puckered, impersistent bunches of elongate cleavage flakes interlayered with granoblastic aggregates of slightly elongated, medium grained quartz and occasionally, ribbon-like quartz and alkali feldspar. Rose muscovite is distinctly pleochroic in shades of rose colours (Table 1). Biotite laths (pleochroic from very pale yellow to yellowish brown; manganophyllite?), rods of piedmontite (pleochroic from yellowish brown to reddish or pinkish brown or brownish pink; few grains show pale pink to pink pleochroism) and slightly elongate granoblastic to subidioblastic haematite are oriented parallel to and intimately interleaved with runs of rose muscovite grains.

Table 1 gives pleochroism, β refractive index, cell dimensions, β angle and chemical analysis of one sample of rose muscovite (63) from rose mica schist. The chemical analysis of one sample of colourless muscovite (63A) from the closely associated non-rose mica schist is also given for comparison. An X-ray diffractogram of rose muscovite was taken on a Philips X-ray Diffraction Unit (Model No. PW 1730) with Ni-filtered $\text{CuK}\alpha$ radiation run at 45 kV at 25 mA. Powdered rose muscovite sample was sprayed on a glass slide to fill in a small tank ($20 \times 15 \times 1$ mm) grooved in the glass plate and carefully pressed to avoid preferred orientation of flaky grains. Aluminium powder was used as internal standard. Rose muscovite is identified as $2M_1$ type.

In normal thin section, the pleochroism is weak but quite distinct while in slightly thicker sections strong pleochroism in shades of rose colours is very

prominent. The chemical analysis of rose muscovite (63) shows that MnO is present in appreciable amount (1.32%) and also Fe_2O_3 (Table 1), while Li is very low; in colourless muscovite (63A) from non-rose mica schist, however, MnO is much lower (0.02%) and Fe_2O_3 is high.

Rose or pink muscovites have been described mostly from pegmatites² and only rarely from mica schists. Pink hues in muscovites are variously attributed to the presence of one or more elements, copper, lead, fluorine, titanium, cobalt, lithium, manganese and ferric iron²⁻³. It was concluded² that the pink colour of rose muscovite in pegmatites was not 'due to the mere presence of either Fe or Mn, nor even to their combined presence, but to the essential absence of Fe^{2+} and the equality or predominance of Mn^{3+} with respect to Fe^{3+} '. Although Mn^{3+} is frequently present in pink muscovites, 'it is not the primary colouring agent in a large number of pink muscovites; iron rather than manganese appears to be the common contributor to the absorption spectra of pink muscovites'³. Further, 'pink colour in muscovite results from substitution of ferric iron for silicon or aluminium in tetrahedral sites'³ and the intensity of pink colour is dependent upon the amount of Fe^{3+} in the tetrahedral layer and not on the absolute amount of iron in muscovite³. Whether Fe^{3+} is in tetrahedral or octahedral sites of pink muscovites has not yet been conclusively resolved⁴⁻⁶. However, from the Mössbauer study of pegmatitic muscovites it has been concluded that the distribution of Fe^{2+} and Fe^{3+} in the octahedral layer controls the green and red colour of pegmatitic muscovite⁷.

Pleochroic manganese-bearing muscovite, called alurgite (or phengite with appreciable Mn content⁸) has been described from gondite and pegmatite intrusive in the latter from the manganese mines in India⁹⁻¹⁰. The presence of thin lenticular sporadic bodies of gondites within the mica schist body mapped in the present

Table 1. Wet chemical analysis, optics and XRD data of rose muscovite in rose mica schist (63) and colourless muscovite in nonrose mica schist (63A) from a quarry about 0.25 km south of Amakocha.

Sample	63		63A		Number of ions on the basis of 24 (O, OH, F)		
	63	63A	63	63A	63	63A	
SiO_2	49.09	44.34	Si	7.184	8.00	6.447	Cell dimensions and optical data of rose muscovite (63)
Al_2O_3	26.62	31.30	Al	0.816		1.553	
TiO_2	0.53	1.10	Al	3.779	5.30	3.811	$a = 5.16 \text{ \AA}$ $b = 9.04 \text{ \AA}$ $c = 20.04 \pm 0.05 \text{ \AA}$ $\beta = 95^\circ 6'$
Fe_2O_3	1.75	4.19	Ti	0.058		0.119	
FeO	0.57	1.05	Fe^{3+}	0.192	0.458	2.63	
MnO	1.32	0.02	Fe^{2+}	0.069	0.127		Pleochroism: $\alpha =$ very light rose with violetish tint $\beta =$ light rose $\gamma =$ rose $\beta(\text{R.I.}) = 1.601$
MgO	4.76	2.74	Mn	0.164	0.002	2.03	
CaO	0.63	1.18	Mg	1.038	0.594		2.63
Na_2O	0.42	2.53	Ca	0.098	0.185	2.63	
K_2O	9.72	9.34	Na	0.120	0.714		2.63
L.O.I.	4.55	n.d.	K	1.816	1.732		
Li (ppm)	99.96	97.79					
Rb (ppm)	145	66					
	335	43					

Chemical analysis by B. P. Gupta; Li and Rb in AAS by A. Roy (63) and B. P. Gupta (63A).

area^{1,11-12} suggests that pelitic sediments metamorphosed to mica schists were manganiferous in places to give rise to gondites and/or pink colouration to some muscovite schist. It is significant that brownish pink, pink or reddish pink piedmontite is present in gondites and only in those mica schists which are rose coloured. But since piedmontite occurs as a minor accessory in these rose mica schists, its contribution to the rose colour of the schist is trivial. Nevertheless its presence in rose mica schists of the present area is symptomatic for their manganiferous nature. The fairly high MnO content of the rose muscovites compared to the colourless muscovite and their distinct pleochroism in shades of rose colours suggest that the rose colour is primarily due to high manganese content in rose muscovites. Thus, the role of manganese appears to be the most important factor for the rose colour of these muscovites.

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Purification and some properties of a virus causing chlorotic mottle disease in carnations (*Dianthus caryophyllus* L.)

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A virus causing vein chlorosis, leaf mottling, chlorotic spots, growth stunting and flower damage in carnations (*Dianthus caryophyllus* L.) was transmitted by *Myzus*

persicae in a non-persistent manner. In *D. barbatus* sap, the virus had thermal inactivation point 55–60°C, dilution end point 10^{-2} – 10^{-3} and longevity *in vitro* 4–5 days at room temperature. The virus was purified by PEG precipitation and sucrose density gradient centrifugation. Virus particles were flexuous rods of 718 × 12 nm.

DIANTHUS caryophyllus L. is an important economic ornamental plant for cut flowers in floriculture trade. Viruses adversely affect the flowers deteriorating their market value. Carnation latent virus¹, carnation vein mottle virus², carnation yellow fleck virus³, carnation necrotic fleck virus⁴ and carnation streak virus⁵ occur naturally in carnations. During the past few years, a disease characterized by vein chlorosis, leaf mottling and chlorotic spots on the leaf (Figure 1) followed by stunting and flower damage (Figure 2) was observed on carnations. This note reports the transmission, host range, purification and electron microscopic studies of the virus-isolate causing chlorotic mottle disease of carnations studied for the first time in India.

Inocula were prepared by grinding infected leaf tissues in 0.02 M potassium phosphate buffer, pH 7.5. Carborundum (600 mesh) was added as an abrasive and test plants were inoculated by rubbing with forefinger dipped in inoculum. Five to ten plants of different species of Caryophyllaceae, Amaranthaceae, Leguminosae,



Figure 1. Vein chlorosis, mottle and spots on infected leaves of *Dianthus caryophyllus* L.