II.—*Analysis of a Serpentine from Japan.*

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Quite recently I obtained from an importation of Japanese curiosities two pairs of chop-sticks which were catalogued and sold as *jade*. Under this name are often included, not only the true jade or nephrite, with a hardness of 6 and a specific gravity approaching 3, but also three other mineral species. Of these *jadeite* is not only harder but heavier than jade: *prehnite* differs but slightly from jade in either of these characters; while *fluor*, the remaining species referred to, has a hardness of 4 only. Had the specimens to which I now direct attention belonged to any of the foregoing species, they would have been worthy of notice on account of their extraordinary size, or rather length, and also by reason of the beauty of their appearance. But after I had determined these objects to be serpentine, I thought some particulars as to their characteristics might prove of service in identifying one of the materials employed in oriental art.

The specimens are no less than 10¼ inches in length. Their colour is of the faintest greyish yellow: their translucency is so considerable as almost to pass into transparency. The hardness of the specimens is 5, and the specific gravity 2·58 The following are the analytical results obtained in the chemical examination of this Japanese serpentine.

Placed *in vacuo* over sulphuric acid the powdered mineral showed a very trifling loss of moisture, doubtless hygroscopic—

·7454 gram lost ·0025 gram H_2O, or ·34 per cent.

Even at 100° C. or rather at the temperature of the water-oven, the water removed was but ½ a per cent. and cannot be regarded as essential—

1·0145 gram lost ·0055 gram H_2O or ·54 per cent.

On submitting the powdered mineral, after its weight had become constant in the water-oven, to a prolonged ignition, the result was—

(I).—1·009 gram lost ·123 gram, or 12·16 per cent.

The further analysis of the mineral was made in two ways. In one experiment, the decomposition of the serpentine was accomplished by the long-continued action of hydrochloric acid; in the other, the mineral was fused with the usual mixture of sodium and potassium carbonates. The following results were obtained—

(II).—*Acid Method.*—·743 gram gave ·3385 gram SiO_2; ·861 gram $Mg_2P_2O_7$; and ·0165 gram Al_2O_3 and Fe_2O_3.

(III).—*Fusion Method.*—·709 gram gave ·3205 gram SiO_2; ·8435 gram $Mg_2P_2O_7$; and ·017 gram Al_2O_3 & Fe_2O_3.

Disregarding the insignificant losses of water *in vacuo*, and at 100°, we may tabulate the above results thus—

	I.	II.	III.	
Silica	—	.. 45·56	.. 45·20	per cent.
Magnesia	—	.. 41·75	.. 42·86	,,
Alumina and ferric oxide	—	.. 2·22	.. 2·12	,,
Water	12.19	.. —	.. —	,,

Now these percentages agree fairly well with those demanded by the accepted formula of true serpentine, $3\,MgO,\ 2\,SiO_2,\ 2\,H_2O$; which are—

Silica	43·48	per cent.
Magnesia	43·48	,,
Water	13·04	,,

The divergences between these theoretical numbers and those furnished by experiment are easily explained, when we recollect the interference caused by the intrusion of the alumina and ferric oxide, and when we take into account the sources of error inseparable from analytical work: the slight deficiency of water may be due to the specimen having become heated during the process of polishing to which it had been submitted. Indeed, it is strange to note how wonderfully accordant all recent analyses of serpentine are with one another and with theory. It is especially strange when we recollect the physical state of this species and the nature of the minerals from which, in many instances, it must have been derived.

A word, in conclusion, concerning the state in which the water exists in this mineral. Rammelsberg has shown that exactly half the water in serpentine is easily disengaged at a comparatively low temperature, but that a considerable heat and a prolonged ignition are necessary in order to expel the remainder. This fact confirms that formula for this silicate, which other considerations support, namely—

$$\left.\begin{matrix} 3\,MgO \\ H_2O \end{matrix}\right\} 2\,SiO_2 + Aq.$$