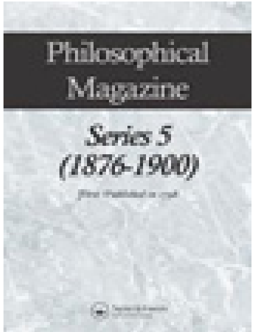

Philosophical Magazine Series 5

ISSN: 1941-5982 (Print) 1941-5990 (Online) Journal homepage: http://www.tandfonline.com/loi/tphm16

Fresh researches on the metal davyum

M. Serge Kern

To cite this article: M. Serge Kern (1877) Fresh researches on the metal davyum, Philosophical Magazine Series 5, 4:26, 395-396, DOI: 10.1080/14786447708639360

To link to this article: http://dx.doi.org/10.1080/14786447708639360

Published online: 13 May 2009.

An extended study of these various conditions has led to the elucidation of the nature of hardening, softening, tempering, annealing, &c. of iron and steel, and has further shown that numerical values may be assigned to these states.

In brief, the research establishes :—

1. The existence in steel, and in iron containing *free* carbon, of a contraction or shortening which is excited by heat, and which proceeds simultaneously with the dynamical expansion and masks its true amount. This is divisible into *high* and *low* temperature contraction. [Compare figs. 4 & 5.]

2. The presence of a cooling expansion or crystallization, which comes in during the dynamical contraction and masks its true amount.

3. These effects, due to crystallization and decrystallization, are the causes of the so-called kicks, or temporary contractions and expansions, which occur during the heating and cooling of the steel.

4. That the low-temperature contraction and cooling expansion are due to decrystallization and crystallization which occur during the acts of heating and cooling, while the kicks themselves are simply the thermal effects associated with these changes, and are proportionate to their extent.

5. That protracted annealing (that is, *extremely slow cooling*) brings about molecular separation of the carbon and iron; and steel in such a state contracts greatly when high temperatures are reached, producing the *contraction returns* seen at the end of the heating, and which are due to the condensation produced by the recombination of the carbon and iron. Steels in this state are less susceptible to cooling-expansion (crystallization), and therefore to low-temperature contraction on subsequent heating. [*Vide* fig. 5.]

LIV. *Intelligence and Miscellaneous Articles.*

FRESH RESEARCHES ON THE METAL DAVYUM. BY M. SERGE KERN.

As I intimated in my first Note addressed to the Academy, my ingot of davyum weighed 0·27 grm. The metal was dissolved in aqua regia in order to examine the action of different reagents upon the solution.

Potass gives a bright yellow precipitate of hydrate of davyum, which is readily attacked by acids, even by acetic acid. The hydrate dissolved in nitric acid gives a brownish mass of nitrate of davyum; on calcining this salt, a black product is obtained, which is probably the monoxide.

The chloride, dissolved in a solution of potassic cyanide, gives, when the solution is slowly evaporated, beautiful crystals of a double cyanide of davyum and potassium. The potassium in this salt can be replaced by several metallic elements. Cyanodavic acid is very unstable; it is isolated by passing a current of sulphuretted hydrogen through a solution of a double cyanide of lead and davyum.

In acid solutions of davyum sulphuretted hydrogen produces a precipitate of sulphuret of davyum, which is readily attacked by the alkaline sulphurets, probably giving a series of sulpho-salts.

A concentrated solution of davyum chloride gives, with potassic sulphocyanide, a red precipitate which, slowly cooled, produces large red crystals. If the same precipitate is calcined, the davyum sulphocyanide takes the form of a black powder. These reactions show that this salt is allotropic.

The chloride is very soluble in water, alcohol, and ether; but the crystals of this salt are not deliquescent. Calcined, the salt gives as residue the monoxide. The chloride of davyum forms double salts with the chlorides of potassium and ammonium; they are insoluble in water, and highly soluble in absolute alcohol. The double salt of sodium and davyum is almost insoluble in water and in alcohol; this reaction is characteristic, because several sodic salts of the platinum group are highly soluble in water.

This chloride of davyum is the only one that exists, as the second product, containing more chlorine, decomposes during the evaporation of the solution, liberating chlorine.

I have made some new researches upon the density of cast davyum; three experiments gave the following numbers—9·388, 9·387, 9·392 at 24° C.

These results agree very closely with those of my first trials: the density given in my first Note was 9·385 at 25°.

M. Alexejeff, engineer, has undertaken the determination of the equivalent of davyum; but as the quantity of the metal which I possess is very trifling, accurate results are very difficult to obtain. Some preliminary experiments have shown that the equivalent is above 100, and probably not far from 150–154.

An additional quantity of platiniferous sand which will be placed at our disposal will give a sufficient supply of the new metal for fresh experiments; we expect to have, in a little time, about 1·2 gramme of davyum.—*Comptes Rendus de l'Académie des Sciences*, October 1, 1877, tome lxxxv. pp. 623, 624.

THE GAMUT OF LIGHT. BY PLINY EARLE CHASE.

In accordance with a suggestion of Dr. Henry Draper, that I should test some of my views by the spectral lines, I have undertaken a preliminary investigation, with the following result.

In the harmonic progression, $\frac{c}{n}, \frac{c}{n+a}, \frac{c}{n+2a}$, &c., let c=wave-length of Fraunhofer line A, =761·20 millionths of a millimetre; n=1·015, a=·0918, and we find the following accordances:—

Numerator.	Denominators.	Quotients.	Observed.	Kirchhoff.
761·20	$n+a$	687·75	687·49 B	592·7
	$n+2a$	635·07	634·05	783·8
	$n+3a$	589·89	589·74 D_γ	1005·1
	$n+4a$	550·72	550·70	1306·6
	$n+5a$	516·42	517·15	1655·6
	$n+6a$	486·14	486·52 F	2080·0
	$n+7a$	459·22	458·66	2436·5
	$n+8a$	435·12	435·67	2775·7
	$n+9a$	413·43	?	?
	$n+10a$	393·79	393·59 H′	H′