始

電氣試驗所研究報告

第二百十一號

RESEARCHES OF THE ELECTROTECHNICAL LABORATORY

KIYOSHI TAKATSU, DIRECTOR.

NO. 211

ON THE DEVITRIFICATION OF GLASSES

(SUPPLEMENT TO THE FOURTH REPORT)

BY

KOZO TABATA

Sept., 1927.

ELECTROTECHNICAL LABORATORY,
MINISTRY OF COMMUNICATIONS,
TOKYO, JAPAN.

RESEARCHES
OF THE
ELECTROTECHNICAL LABORATORY

KIYOSHI TAKATSU, DIRECTOR.

NO. 211

ON THE DEVITRIFICATION OF GLASSES
(SUPPLEMENT TO THE FOURTH REPORT)

BY

KOZO TABATA

SYNOPSIS

The same method of surface devitrification by heat as described in the previous papers by the author has been applied to the series of glasses having compositions of 1.0 R_2O, 0.5 MgO, y. SiO_2; 1.0 R_2O, 0.75 MgO, y. SiO_2; 1.0 R_2O, 1.0 MgO, y. SiO_2; 1.0 R_2O, 1.5 MgO, y. SiO_2 and 1.0 R_2O, 2.0 MgO, y. SiO_2.

The results have given a proof that MgO in those glasses, in combination with SiO_2, made a compound of a form MgO, 2 SiO_2, and also that the molecules of MgO, 2 SiO_2 dissolved no silica in them.

February, 1927.

CONTENTS

ON THE DEVITRIFICATION OF GLASSES

(SUPPLEMENT TO THE FOURTH REPORT)

BY

KOZO TABATA

INTRODUCTORY.

The same method of the surface devitrification by heat has been applied to the glasses consisting of R_2O, MgO and SiO_2.

In the experiment of other kinds of glasses, it was necessary to seek the points of no devitrification to each series of melt by previous experiments, as seen in Researches No. 175 and No. 191.

In this case, however, by analogy of the results gained in the foregoing experiments, the boundary lines of devitrification for each series of glasses; R_2O, $0.5\,MgO$, $y.\,SiO_2$; R_2O, $1.0\,MgO$, $y.\,SiO_2$; R_2O, $1.5\,MgO$, $y.\,SiO_2$ and R_2O, $2.0\,MgO$, $y.\,SiO_2$ have been assumed; namely that MgO combined to $MgO, 2\,SiO_2$ and also that molecules of $MgO, 2SiO_2$ dissolved no silica in it.

CHAPTER I. EXPERIMENT.

The experiment was conducted under the same way as described in pages 13 to 14 of the preceding report.

The conditions, the results etc. are summarized in the following tables.

TABLE I.

Exp. Nos.	Chemical Composition (batch)			Heating Conditions	Degrees of Devitrification
MgO—501	1.0 Na_2O,	0.5 MgO,	3.25 SiO_2	715°C—300^{m}	0
MgO—502	〃		3.5 〃	〃	1
MgO—503	〃		3.75 〃	725°C—300^{m}	2
MgO—504	〃		4.0 〃	〃	3
MgO—505	〃		4.25 〃	730°C—300^{m}	4
MgO—506	0.75 Na_2O 0.25 K_2O,	0.5 MgO,	4.25 〃	740°C—300^{m}	0
MgO—507	〃		4.5 〃	〃	1
MgO—508	〃		4.75 〃	750°C—300^{m}	2
MgO—509	〃		5.0 〃	〃	3
MgO—510	〃		5.25 〃	755°C—300^{m}	4
MgO—511	0.5 Na_2O 0.5 K_2O,	0.5 MgO,	5.25 〃	765°C—300^{m}	0
MgO—512	〃		5.5 〃	〃	1
MgO—513	〃		5.75 〃	775°C—300^{m}	2
MgO—514	〃		6.0 〃	〃	3
MgO—515	〃		6.25 〃	780°C—300^{m}	4
MgO—516	0.25 Na_2O 0.75 K_2O,	0.5 MgO,	6.25 〃	790°C—300^{m}	0
MgO—517	〃		6.5 〃	〃	1
MaO—518	〃		6.75 〃	800°C—300^{m}	2
MgO—519	〃		7.0 〃	〃	3
MgO—520	〃		7.25 〃	805°C—300^{m}	4
MgO—521	1.0 K_2O,	0.5 MgO,	7.25 SiO_2	810°C—300^{m}	0
MgO—522	〃		7.5 〃	〃	1
MgO—523	〃		7.75 〃	825°C—300^{m}	2
MgO—524	〃		8.0 〃	〃	3
MgO—525	〃		8.25 〃	830°C—300^{m}	4

TABLE II.

Exp. Nos.	Chemical Composition (batch)			Heating Conditions	Degrees of Devitrification
MgO—1001	1.0 Na_2O,	1.0 MgO,	4.25 SiO_2	750°C—300^{m}	0
MgO—1002	〃		4.5 〃	〃	1
MgO—1003	〃		4.75 〃	760°C—300^{m}	2
MgO—1004	〃		5.0 〃	〃	3
MgO—1005	〃		5.25 〃	765°C—300^{m}	4
MgO—1006	0.75 Na_2O 0.25 K_2O,	1.0 MgO,	5.25 〃	775°C—300^{m}	0
MgO—1007	〃		5.5 〃	〃	1
MgO—1008	〃		5.75 〃	785°C—300^{m}	2
MgO—1009	〃		6.0 〃	〃	3
MgO—1010	〃		6.25 〃	790°C—800^{m}	4
MgO—1011	0.5 Na_2O 0.5 K_2O,	1.0 MgO,	6.25 〃	800°C—300^{m}	0
MgO—1012	〃		6.5 〃	〃	1
MgO—1013	〃		6.75 〃	810°C—300^{m}	2
MgO—1014	〃		7.0 〃	〃	3
MgO—1015	〃		7.25 〃	815°C—300^{m}	4
MgO—1016	0.25 Na_2O 0.75 K_2O,	1.0 MgO,	7.25 〃	825°C—300^{m}	0
MgO—1017	〃		7.5 〃	〃	1
MgO—1018	〃		7.75 〃	835°C—300^{m}	2
MgO—1019	〃		8.0 〃	〃	3
MgO—1020	〃		8.25 〃	840°C—300^{m}	4
MgO—1021	1.0 K_2O,	1.0 MgO,	8.25 〃	850°C—300^{m}	0
MgO—1022	〃		8.5 〃	〃	1
MgO—1023	〃		8.75 〃	860°C—300^{m}	2
MgO—1024	〃		9.0 〃	〃	3
MgO—1025	〃		9.25 〃	865°C—300^{m}	4

TABLE III.

Exp. Nos.	Chemical Composition (batch)	Heating Conditions	Degrees of Devitrification
MgO—1501	1.0 Na_2O, 1.5 MgO, 5.25 SiO_2	775°C—300^m	0
MgO—1502	〃 5.5 〃	〃	1
MgO—1503	〃 5.75 〃	785°C—300^m	2
MgO—1504	〃 6.0 〃	〃	3
MgO—1505	〃 6.25 〃	790°C—300^m	4
MgO—1506	0.75 Na_2O 0.25 K_2O, 1.5 MgO, 6.25 〃	800°C—333^m	0
MgO—1507	〃 6.5 〃	〃	1
MgO—1508	〃 6.75 〃	810°C—300^m	2
MgO—1509	〃 7.0 〃	〃	3
MgO—1510	〃 7.25 〃	815°C—300^m	4
MgO—1511	0.5 Na_2O 0.5 K_2O, 1.5 MgO, 7.25 〃	825°C—300^m	0
MgO—1512	〃 7.5 〃	〃	1
MgO—1513	〃 7.75 〃	835°C—300^m	2
MgO—1514	〃 8.0 〃	〃	3
MgO—1515	〃 8.25 〃	840°C—300^m	4
MgO—1516	0.25 Na_2O 0.75 K_2O, 1.5 MgO, 8.25 〃	850°C—300^m	0
MgO—1517	〃 8.5 〃	〃	1
MgO—1518	〃 8.75 〃	860°C—300^m	2
MgO—1519	〃 9.0 〃	〃	3
MgO—1520	〃 9.25 〃	865°C—300^m	4

TABLE IV.

Exp. Nos.	Chemical Composition (batch)	Heating Conditions	Degrees of Devitrification
MgO—2001	1.0 Na_2O, 2.0 MgO, 6.25 SiO_2	800°C—300^m	0
MgO—2002	〃 6.5 〃	〃	1
MgO—2003	〃 6.75 〃	810°C—300^m	2
MgO—2004	〃 7.0 〃	〃	3
MgO—2005	〃 7.25 SiO_2	815°C—300^m	4
MgO—2006	0.75 Na_2O 0.25 K_2O, 2.0 MgO, 7.25 〃	825°C—300^m	0
MgO—2007	〃 7.5 〃	〃	1
MgO—2008	〃 7.75 〃	835°C—300^m	2
MgO—2009	〃 8.0 〃	〃	3
MgO—2010	〃 8,25 〃	840°C—300^m	4
MgO—2011	0.5 Na_2O 0.5 K_2O, 2.0 MgO, 8.25 〃	850°C—300^m	0
MgO—2012	〃 8.5 〃	〃	1
MgO—2013	〃 8.75 〃	860°C—300^m	2
MgO—2014	〃 9.0 〃	〃	3
MgO—2015	〃 9.25 〃	865°C—300^m	4
MgO—2016	0.25 Na_2O 0.75 K_2O, 2.0 MgO, 9.25 〃	875°C—300^m	0
MgO—2017	〃 9.5 〃	〃	1
MgO—2018	〃 9.75 〃	885°C—300^m	2
MgO—2019	〃 10.0 〃	〃	3
MgO—2020	〃 10.25 〃	890°C—300^m	4

CHAPTER II. SUMMARIES AND CONCLUSIONS.

The crystallization of magnesium silicate during sample forming before devitrification experiment has happened remarkably for glasses containing more than 1.5 mols of MgO and the molar percent of K_2O in alkalies being below 40%.

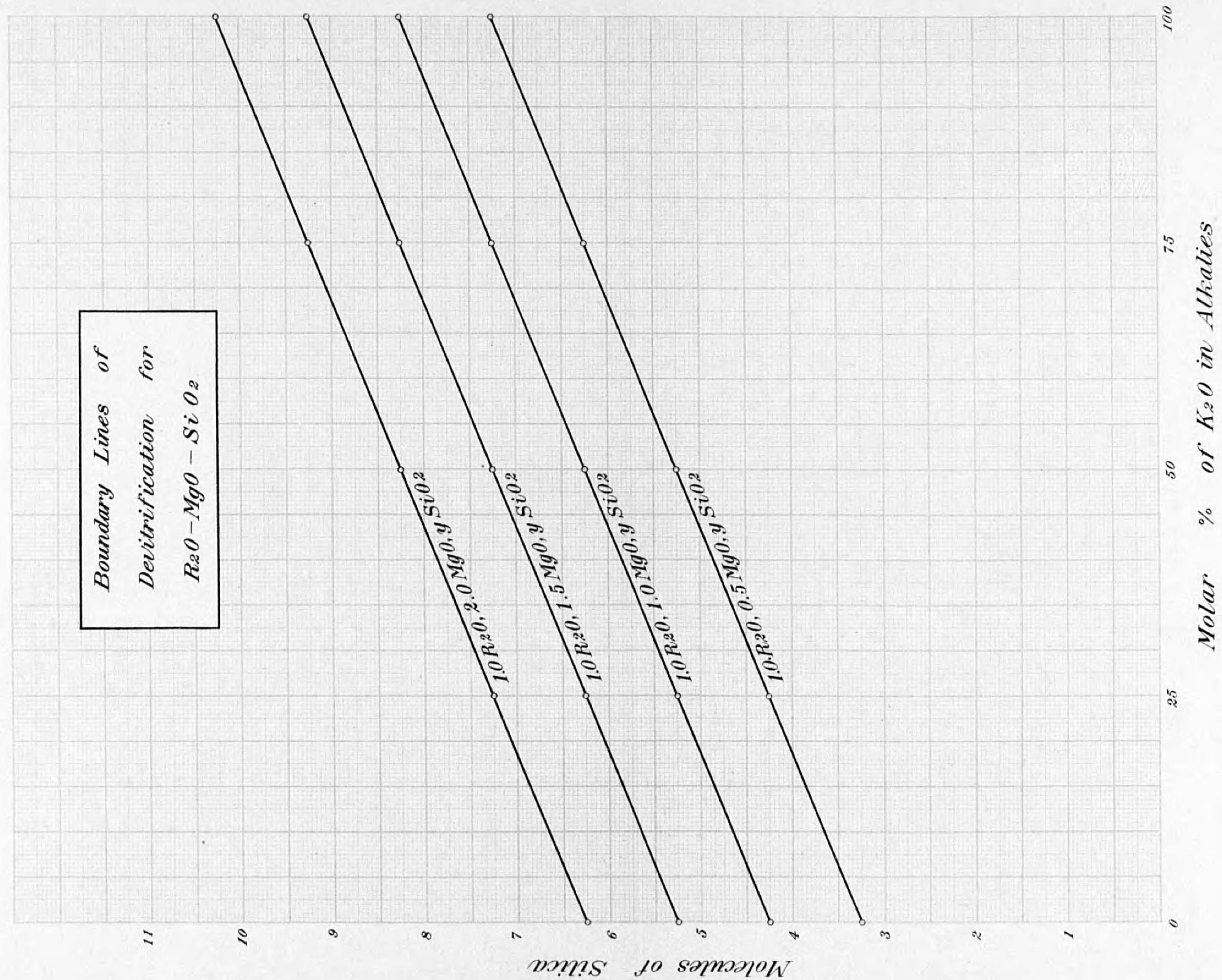
The action of weathering was marked for glasses containing less than 0.5 mols of MgO to 1 mol of R_2O—a fact which was common to all other kind of glasses.

From the results of the experiment, the author gave the constitution to the glasses of R_2O–MgO–SiO_2, $R_2O, 2\,SiO_2 + MgO, 2\,SiO_2 + SiO_2$.

The quantity of silica to be dissolved in molecules of $MgO, 2\,SiO_2$ coincided well as had been assumed from the relation between the quantity of silica dissolved in simple silicates and the atomic volume of the respective metallic element.

...MARIES AND CONCLUSIONS.

...silicate during sample forming before devitrifica-
...kably for glasses containing more than 1.5 mols
...K_2O in alkalies being below 40%.
...arked for glasses containing less than 0.5 mols
...which was common to all other kind of glasses.
...ent, the author gave the constitution to the
...SiO_2 + MgO, 2 SiO_2 + SiO_2.
...issolved in molecules of MgO, 2 SiO_2 coincided
...relation between the quantity of silica dissolved
...ume of the respective metallic element.



昭和2年11月5日印　刷
昭和2年11月8日發　行

電氣試驗所編

編纂•發行•印刷人
倉　橋　藤　治　郎
東京市麴町區有樂町1工政會

發　行　所
工　政　會　出　版　部
東京市麴町區有樂町1—1
電話丸の內(23)　3980番
振替東京27724番

¥ .40

終