

High Pressure Synthesis of Perovskite-type
Oxide Complex Containing Pb⁺⁺

by Osamu FUKUNAGA, Takehiro NAKAGAWA,
Shoichiro NOMURA, Shinroku SAITO

(The Japan Society of Physics at Okayama in 1965)

Abstract

It is difficult to synthesize some perovskite structure-type oxide complex $A(B_xB'_{1-x})O_3$ containing Pb⁺⁺ at A-site and paramagnetic ions Ni²⁺, Co²⁺, Co³⁺, Fe²⁺, Fe³⁺, etc. in a part of B-site at atmospheric pressure because PbO and Bi₂O₃ easily sublime and have low melting temperatures. The melting temperatures, however, increase with increasing pressure. Satisfactory results were expected in the synthesis of these compounds at high temperatures and high pressures. A piston-cylinder type high temperature-high pressure apparatus was used in the range to 45 kb., 1700°C. Table 1 shows the experimental results and Pb(NiW)_{1/2}O₃, Pb(Co_{2/3}W_{1/2})O₃, etc. were synthesized satisfactorily.

Table 1

	Temp. (°C)	Pres. (kb)	Duration (hr)	Starting Material	Note
Pb(CoW) _{1/2} O ₃	850	35	1	PbO, CoCO ₃ , H ₂ WO ₄	Perovskite $a=8.030\text{Å}$
Pb(NiW) _{1/2} O ₃	850	35	1	PbO, NiO, H ₂ WO ₄	" $a=7.977\text{Å}$
"	1200	36	1	"	" + (?)
"	800	30	2.5	"	"
Pb(Co _{2/3} W _{1/3})O ₃	850	30	10min.	PbO, CoCO ₃ , H ₂ WO ₄	" $a=8.021\text{Å}$
Pb(FeW) _{1/2} O ₃	850	30	1	PbO, FeO, H ₂ WO ₄	" + pyrochlore
Pb(CoMo) _{1/2} O ₃	850	30	1	PbO, CoO, MoO ₃	" - PbMoO ₄