X-ray diffraction studies of Mg$_2$Si and Ag-doped Mg$_2$Si under pressure$^1$ YOSHIHISA MORI, YUJI KAIHARA, KEN-ICHI TAKARABE, Okayama University of Science — The magnesium disilicide (Mg$_2$Si) is one of the thermoelectric material in 500-800 K temperature rage. The $p$- and $n$-Mg$_2$Si materials are necessary for the high-performance thermoelectric device, however Mg$_2$Si is $n$-type semiconductor and stable $p$-type Mg$_2$Si has not developed. Because it was reported that Ag-dope Mg$_2$Si was $p$-type Mg$_2$Si, we performed the X-ray diffraction studies of Mg$_2$Si and Ag-doped Mg$_2$Si under high-pressure at NE-5C beam line (PF-AR). Four samples which were a high-purity Mg$_2$Si powder, a mixture of Mg and Si powders, and Ag-doped these powders were papered. Mg$_2$Si decomposed with increasing temperature, and new peaks of MgO and SiO$_2$ appeared beyond 673 K. The Mg$_2$Si with Ag also decomposed and the oxide peaks appeared, and Ag peaks did not disappear. In the case of Mg and Si powder, Mg$_2$Si was synthesized at 573 K and Mg peaks disappeared with increasing temperature but MgO or SiO$_2$ peaks did not appeared. In the case of Ag-doped Mg and Si powder, Mg$_2$Si was synthesized at 523 K, and Ag peaks disappeared at 823 K and MgO or SiO$_2$ peaks did not also appeared. The result means the possibility of the synthesis of Ag-doped Mg$_2$Si under pressure.

$^1$This work was supported by MEXT KAKENHI(C) Grant Number 11013342, and has been performed under the approval of the Photon Factory Program Advisory Committee (Proposal No. 2010G668, 2012G566).