COMPOUND CHONDRULE FORMATION: CLUES FROM OXYGEN ISOTOPIC RATIOS AND MAJOR-ELEMENT CONCENTRATIONS. T. Akaki[1] and T. Nakamura[1], [1]Dept. of Earth Planet. Sci., Fac. of Sci., Kyushu Univ., Hakozaki, Fukuoka 812-8581, Japan.

Thirty sets of compound chondrules were identified from Allende and Axtell CV3, including 24 adhering and 6 enveloping types, based on the compound-chondrule classification [1]. The adhering type consists of two chondrules fused together (Fig. 1), whereas the enveloping type has a core chondrule within a host chondrule (Fig. 2). SIMS analysis indicated that olivine and low-Ca pyroxene in 8 out of 9 adhering types have similar oxygen compositions that distribute in a range from -5 to 5 ‰$\delta^{18}O_{SMOW}$ and from -10 to 0 ‰$\delta^{17}O_{SMOW}$ and cluster around the CCAM line. On the other hand, oxygen compositions differ between the two constituent chondrules in one adhering type. Olivines at the core of a chondrule ("Right" in Fig. 1) are ^{16}O-rich down to -15‰$\delta^{18}O_{SMOW}$ (indicated by arrows in Fig .1), while those at outer portions of this chondrule and those in entire portions of the other chondrule showed similar ^{16}O-poor composition. This indicates that, when the two chondrules fused together, the core of the former chondrule was not melted, whereas the outer portions of both chondrules were melted that facilitated exchanges with ^{16}O-poor nebular gas. In fact, petrologic observation showed that no boundary plane was recognized between the two chondrules, confirming the melting of outer portions of both chondrules. These results suggest that the adhering type was formed during a single heating event by a collision between totally and partially molten two particles. In the 3 isotope diagram, all oxygen data of 9 adhering compound chondrules fall on the typical area obtained from single chondrules, therefore the two precursors of the adhering types were originated from the same dust reservoirs as that of single chondrules.

We found, from the electron-microprobe analysis of the enveloping types, that the host chondrules tend to have higher FeO and lower Al_2O_3 and CaO contents than the core chondrules. The results are consistent with the enveloping-type formation model [1], which envisages the enveloping type was formed by a flash melting of a porous Fe-rich dust clump on a preexisting chondrule, thus it needs two times of heating for the formation. Oxygen isotope measurements of 2 enveloping types indicated that the core and the host chondrules have similar compositions (Fig. 2). On the other hand, another 2 enveloping types showed different oxygen compositions between the core and the host chondrules: one enveloping type has an ^{16}O-rich core and an ^{16}O-poor host, while the other has an ^{16}O-rich host and an ^{16}O-poor core. All oxygen data of the two enveloping types lie on or close to the CCAM line in a range of$\delta^{18}O_{SMOW}$ from -20 to 5 ‰. This indicates that the enveloping types were formed by two times of heating, during which the oxygen compositions of chondrules, accreting Fe-rich dust, and nebular gas have stayed along the CCAM line.

References: [1] Wasson et al. (1995) *GCA, 59,* 1847-1896.