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Al-C-Rh (Aluminum-Carbon-Rhodium)

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Recently, [2002Kim] determined an isothermal section at 1100 °C for this system in the Rh-rich region. No ternary carbide of the $E2_1$, Co_3AlC_x-type was found.

Binary Systems

In the Al-C system, the stoichiometric compound Al_4C_3 ($D7_1$-type rhombohedral) is present. The Al-Rh phase diagram [2006Kho] (see Fig. 1 under Al-Pd-Rh) depicts the following intermediate phases: Rh_2Al_9 ($D8_d$, Co_2Al_9-type monoclinic), $Rh_{1-x}Al_3$ (orthorhombic, denoted O_1 or ε_{16}), $RhAl_3$ (orthorhombic, denoted O_2 or ε_6), Rh_2Al_5(c) (space group $Pm\bar{3}$, cubic), Rh_2Al_5(h) ($D8_{11}$, Co_2Al_5-type hexagonal), Rh_7Al_3 (monoclinic), and RhAl ($B2$, CsCl-type cubic). The C-Rh system [Massalski2] is of the simple eutectic type, with the eutectic temperature at 1694 °C.

Ternary Phase Equilibria

Starting with high purity elemental powders, [2002Kim] prepared by means of arc-melting under Ar atm (or spark plasma sintering in vacuum) just one alloy with the composition 66.7Rh-22.2Al-11.1C (in atomic percent). This composition corresponds to possible ternary carbide with the stoichiometry of $Rh_3AlC_{0.5}$. Alloy samples were annealed at 1100 °C for 72-144 h. The phase equilibria were studied with electron microscopy, x-ray diffraction and electron probe microanalysis. Differential thermal analysis was carried out at a heating/cooling rate of 10 °C per min. The microstructure showed primary crystals of (Rh), RhAl ($B2$) phase, and graphite. There was no evidence for the presence of ternary carbide. The partial isothermal section at 1100 °C and the liquidus projection constructed by [2002Kim] are shown in Fig. 1 and 2, respectively.

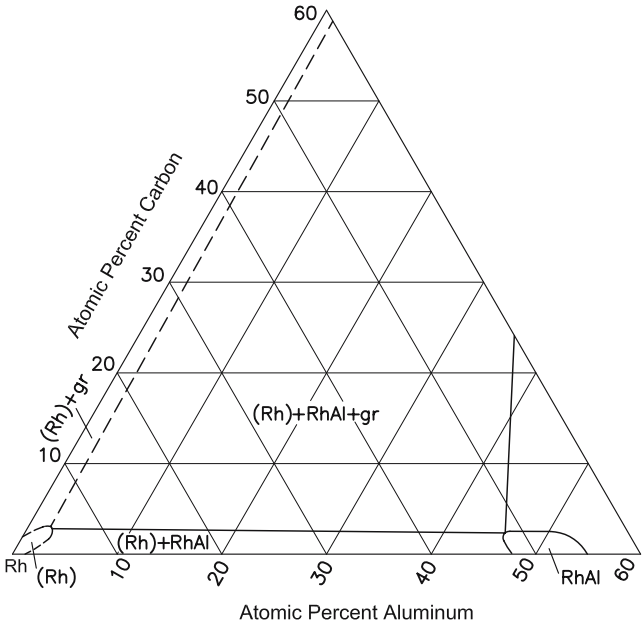

Fig. 1 Al-C-Rh partial isothermal section at 1100 °C [2002Kim]

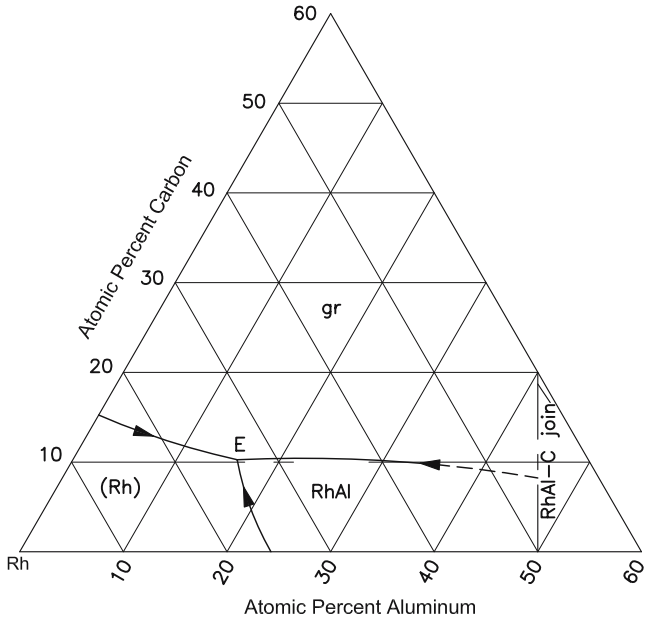

Fig. 2 Al-C-Rh partial liquidus projection [2002Kim]

References

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