XD合成Al$_2$O$_3$，TiB$_2$/Al复合材料的热力学分析

朱和国[1,2]，　吴申庆[1]，　王恒志[2]

(1. 东南大学 材料科学与工程系， 南京 210096；
2. 南京理工大学 材料科学与工程系，南京 210094)

摘　　要： 从热力学的角度讨论了原位反应生成Al$_2$O$_3$和TiB$_2$陶瓷粒子增强铝基复合材料的合成机理。结果表明，在Al-TiO$_2$-B体系中，以一定的加热速率加热至1 073 K左右时，Al与TiO$_2$之间首先发生铝热反应，反应产生出活性钛原子并形成Al-Ti-B反应系；AlB$_2$和Al$_3$Ti均系反应中间产物 AlB$_2$在1 200 K左右时分解为Al和B，Al$_3$Ti被B还原，当B的加入量(摩尔)是TiO$_2$的两倍左右时，Al$_3$Ti基本消失，最终生成Al$_2$O$_3$和TiB$_2$陶瓷颗粒增强的铝基复合材料。

关键字： 原位反应；陶瓷粒子；热力学

Thermodynamics analysis of Al$_2$O$_3$,TiB$_2$/Al composites fabricated by exothermic dispersion method

ZHU He-guo[1,2], WU Shen-qing[1], WANG Hen-zhi[2]

（1. Department of Materials Science and Engineering,
Southeast University, 　Nanjing 210096, P.R.China；
2. Department of Materials Science and Engineering,
Nanjing University of Technology, Nanjing 210094，P.R.China）

Abstract: The thermodynamics of in 　situ reaction from the reaction system of Al-TiO$_2$-B to form Al$_2$O$_3$, TiB$_2$/Al composites was studied. The results show that under the condition of certain heating rate, aluminum reacts with TiO$_2$ firstly at 1 073 K and then forms Al-Ti-B reaction system. The phases of AlB$_2$ and Al$_3$Ti occur during the reaction process as medi-products and the AlB$_2$ phase is decomposed into Al and B at the temperature of about 1 200 K, meanwhile, Al$_3$Ti is deduced by B to form TiB$_2$. When the mole ratio of B/TiO$_2$ is about two, the Al$_3$Ti phase is almost eliminated completely.