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硅相形态及含量对Al-Si合金线膨胀系数的影响

武玉英1，刘相法1，戴 勇2，姜炳刚3，边秀房1

(1．山东大学 材料液态结构及其遗传性教育部重点实验室，济南 250061；
2．济钢集团山东冶金设备制造公司，济南 250101；
3．山东大学 材料科学与工程学院，济南 250061)

摘 要：利用金相显微镜、DIL402C高温膨胀仪等对Al-Si合金的线膨胀进行了研究。结果表明：对于Al-Si合金，硅含量越高，其线膨胀系数越小，随温度变化幅度减小；随着温度升高，磷变质比锶变质的线膨胀系数变化幅度小，合金更加稳定；此外，T6热处理也显著降低Al-Si合金的线膨胀系数。通过对合金线膨胀系数和微观组织的对比观察发现：硅相的形态和体积分数对Al-Si合金的线膨胀系数产生重要影响。初晶硅体积分数的增加和初晶硅的析出能够显著降低Al-Si合金的线膨胀系数，共晶硅的形态对合金线膨胀系数也有一定的影响，共晶硅为短棒状、颗粒状时(尤其经热处理后)，合金的线膨胀系数也显著降低。

关键字： Al-Si合金；线膨胀系数；热处理；变质处理

Influence of morphology and content of silicon phase on TE of Al-Si alloys

WU Yu-ying1, LIU Xiang-fa1, DAI Yong2, JIANG Bing-gang3, BIAN Xiu-fang1

（1. Key Laboratory of Materials Liquid Structure and Heredity, Ministry of Education, Shandong University,Ji’nan 250061, China;
2. Jigang Group Shandong Metallurgy Equipment Manufacture Corporation, Ji’nan 250061, China;
3. School of Material Science and Engineering,Shandong University, Ji’nan 250061, China）

Abstract: The linear coefficient of thermal expansion (CTE) of Al-Si alloys was studied by using Hi-scope video microscope and DIL 402C high temperature dilatometer. The results reveal that the CTE of Al-Si alloys decreases with increasing Si level. Compared with Sr modification, the Al-Si alloy modified with P has a lower CTE and is more stabilized. Moreover, T6 heat treatment can also decrease the CTE of Al-Si alloys， and improve the stability during heating-up. According to the contrasts above and combined with microstructure observation, it is found that Si phase has important influence on CTE of Al-Si alloys. The increase of volume fraction and precipitation of primary Si both can decrease the CTE. Also, eutectic Si

exerts certain influence on the CTE of Al-Si alloys, i.e. the CTE decreases when eutectic Si exhibits morphology of short-bar shape and small particles, especially after heat treatment.

Key words: Al-Si alloys; stability; CTE; heat treatment; modification

地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-8876765，8877197, 8830410 传真： 0731-8877197

电子邮箱： f-ysxb@mail.csu.edu.cn