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机械合金化Al-Mg-Si-Cu元素粉末的特性

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摘要: Al, Mg, Si 和Cu元素粉末按6061铝合金成分比进行了机械合金化(MA), 对其物相、合金化特性、晶格常数、晶粒尺寸及点阵应变作了测定和分析讨论。MA初期晶粒尺寸可以达到纳米级, 最小晶粒尺寸20nm; 粉末点阵应变最终达0.2%; Al晶格常数变化的总趋势是不断减小; 塑性较好的元素粉末可在“面上”作短程扩散, 合金化易于进行, 可实现完全合金化; 硬度较高的脆性元素粉末只在“点上”作短程扩散, 合金化不易进行, 难以实现完全合金化。

关键字: 机械合金化; Al, Mg, Si 和Cu元素粉末; 物性; 合金化特性

Characteristics of Al, Mg, Si and Cu element powders by mechanical alloying

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Abstract: According to the composition of 6061 aluminum alloy, the Al, Mg, Si and Cu element powders were mechanical alloyed. Physics phases, alloying character, lattice constant, grain size and lattice strain of these powders were determined and discussed. At an initial stage of mechanical alloying, grain size can reach up to nanometer level, the finest grain size reach up to 20 nm. Generally, lattice constant is decreased, lattice strain is about 0.20% finally. Ductile element powder can diffuse through a shorter path on the plane, thus, alloying of these element powders is carried out easily and can be realized fully. Otherwise, brittle element powder can only diffuse through a shorter path on the point, its alloying is more difficulty and can be realized partly.

Key words: mechanical alloying; Al, Mg, Si and Cu element powders; physics property; alloying character

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