

论文

脉冲电磁场对 $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 粒度的影响

杜慧玲^{1,2}, 王建中², 齐锦刚², 何力佳², 苍大强¹

1. 北京科技大学冶金与生态工程学院, 北京 100083
2. 辽宁工业大学材料与化学工程学院, 锦州 121001

摘要:

在脉冲电磁场(PEMF)作用下, 采用常规沉淀方法制备了草酸钴($\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$)粉体. 利用XRD, TG-DSC, 松装密度仪以及激光粒度仪对产物的物相、热分解过程及粒度进行了表征. 并基于PEMF和反应体系内微观粒子之间的相互作用提出了 $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 粒度改变的机理. 实验结果表明, 施加及未施加PEMF条件下, 以 $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ 为原料, $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ 为沉淀剂制备的产物均为 $\beta\text{-CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$; 脉冲电压为800 V时, 产物松装密度为0.393 g/cm^3 , 平均粒径为3.5403 μm , 与未施加PEMF条件下制备的样品相比, 分别降低了26.95%和60.13%; 以PEMF制备的 $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 为前驱体, 在Ar气氛下加热分解获得了fcc结构的金属Co粉.

关键词: $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 粒度 脉冲电磁场 Co粉

EFFECTS OF PULSED ELECTROMAGNETIC FIELD ON $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ POWDER SIZE

DU Huiling^{1,2}, WANG Jianzhong², QI Jingang², HE Lijia², CANG Daqiang¹

1. School of Metallurgical and Ecological Engineering, University of Science and Technology Beijing, Beijing 100083
2. School of Material and Chemical Engineering, Liaoning University of Technology, Jinzhou 121001

Abstract:

Metal cobalt powder is a promising material added in steels for cutting tools, alkaline rechargeable batteries or heterogeneous catalysis and others for fabrication of abrasion strengthened composites. The final mechanical performance of composites is affected by the size of cobalt powder, which is closely dependent on the use of cobalt oxalate precursor. Developments of size controlled preparation methodologies are of great interest in materials chemistry. Previous works have revealed that the size of powders can be controlled through addition of some organic surfactants in preparation or by homogeneous precipitation methods. However, the former has a difficulty of separation and the latter has a shortcoming of low yield. In this study, the cobalt oxalate particles were prepared by precipitation using CoCl_2 and $(\text{NH}_4)_2\text{C}_2\text{O}_4$ solutions. Meanwhile a pulsed electromagnetic field (PEMF) was applied to the reaction system to improve the size of these particles. The effects of PEMF on the size of cobalt oxalate particles were investigated, and the mechanism model of interaction between PEMF and reaction system was established. The phase structures of products were characterized by X-ray powder diffraction (XRD). Packing density instrument and Laser Particle Size Analyzer were used to measure the sizes of obtained cobalt oxlate powders. Thermal decomposition was performed using TG-DSC thermogravimetric analyzer. The results indicate cobalt oxalate ($\beta\text{-CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$) particles are formed of the packindensity of 0.393 g/cm^3 and the average diameter of 3.5403 μm at PEMF voltage of 800 V. Compared with the particles prepared without PEMF treatment, the packing density and average diameter decrease by 26.95% and 60.13%, respectively. The results of cobalt oxalate thermolysis show that products prepared from cobalt oxalate with and without PEMF both are $\beta\text{-Co}$ particles. The average diameter of cobalt powders prepared from cobalt oxalate precursor with PEMF is decreased by 71.18% compared with that without PEMF.

This paper offers a simple and rapid separation technique for preparing lower cost cobalt powders, which would be susceptible for industrial application.

Keywords: $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ particle size pulsed electromagnetic field Co powder

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作者简介: 杜慧玲, 女, 1968生, 副教授, 博士生

作者Email: wjz1957@163.com

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