

## · 基础与临床研究 ·

## 加工参数设置对选择性激光熔积钴铬合金硬度的影响

张碧楚 曾 丽 忻贤贞 魏 斌

(上海交通大学医学院附属第九人民医院口腔特需门诊, 口腔修复科,  
上海市口腔医学重点实验室, 上海 200011)

**【摘要】目的** 观测几种加工参数设置对选择性激光熔积 (SLM) 钴铬合金的表面形貌和表面维氏硬度的影响。**方法** 使用正交实验设计 9 组不同的加工参数, 即激光功率为 2500W、2750W、3000W, 扫描速度为 5mm/s、10mm/s、15mm/s, 送粉速率为 3r/min、4.5r/min、6r/min, 制备 9 组选择性激光熔积钴铬合金试件, 每组 5 个 (直径 10mm, 厚度 3mm), 经抛光处理后分别进行扫描电镜观察和表面维氏硬度测试, 采用 SPSS16.0 软件包进行数据处理。**结果** 9 组不同加工参数制备下 SLM 钴铬合金试件的扫描电镜图像均呈现均匀而规则的细胞样结构; 其平均表面维氏硬度均在 345HV 以上。**结论** 当加工参数设置在激光功率 2500~3000W, 扫描速度 5~15mm/s, 送粉速率 3~6r/min 范围内时, SLM 钴铬合金具有较为理想的表面形貌和表面硬度, 能适合临床应用需求。

**【关键词】** 加工参数 选择性激光熔积 钴铬合金 表面硬度

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## Effect of processing parameters on hardness of selective laser melting cobalt-chromium alloy

Zhang Bichu Zeng Li Xin Xianzhen Wei Bin

(Department of Stomatology Special Consultation Clinic, Department of Prosthodontics, Ninth People's Hospital,  
Shanghai Jiao Tong University School of Medicine, Shanghai Key Laboratory of Stomatology, Shanghai 200011)

**【Abstract】Objective** To investigate the effects of several processing parameters on surface morphology and surface hardness of cobalt-chromium (Co-Cr) alloy fabricated by selective laser melting (SLM). **Methods** Nine groups of selective laser melting Co-Cr alloy were fabricated by different processing parameters (laser power: 2500W, 2750W, 3000W; scanning speed: 5mm/s, 10mm/s, 15mm/s; power feeding rate: 3r/min, 4.5r/min, 6r/min) by orthogonal experiment design, each group has five specimens (10mm diameter and 3mm thickness). The specimens' surface morphology was observed by a scanning electron microscope and their Vickers hardness was measured by micro-hardness tester. The data was analyzed with SPSS16.0 software package. **Results** The SEM images showed all selective laser melting Co-Cr alloy had a homogeneous and regular cellular structure and the mean surface Vickers hardness were all above 345HV. **Conclusion** When laser power is set at 2500-3000W, scanning speed is set by 5-15mm/s and power feeding rate is set by 3-6r/min, SLM Co-Cr alloy has both ideal surface property and surface hardness, which can meet the clinical demands.

**【Key words】** Processing parameter Selective laser melting Co-Cr alloy Surface hardness

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通信作者: 魏斌, E-mail: drweibin2003@126.com

选择性激光熔积 (selective laser melting, SLM)  
是一种辅助加工技术, 它根据计算机辅助设计数