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通过延长陶瓷微粒停留时间制备包覆陶瓷微粒

摘要

Geldart C 类陶瓷微粒的流化床化学气相沉积包覆容易出现团聚现象，导致粒径分布宽，表现为在恒温反应区停留时间短，进而导致包覆层质量差和不均匀。为了增加陶瓷微粒在恒温反应区的停留时间，通过螺旋管将微粒轨迹延长了 20 倍。采用经简单设计的流化床-化学气相沉积技术，在陶瓷微粒表面制备了百纳米级厚度的碳包覆层。研究了包覆层的微观结构、形成机理、结合方式和性能。结果表明，首先形成小球形碳，然后形成球壳包覆层。此外，包覆层中的碳原子与陶瓷微粒中的氧原子结合。纳米级厚度的碳包覆层可以作为屏障，保护陶瓷微粒免受纯氢氟酸的长时间腐蚀。

关键词

流化床-化学气相沉积；包覆陶瓷微粒；停留时间；耐腐蚀性

Abstract

Fluidized bed-chemical vapor deposition coating for the Geldart C class ceramic microparticles is prone to aggregate, which leads to a wide particle size distribution and short residence time in the constant temperature reaction area, resulting in poor quality and uneven coating. To increase the residence time of ceramic microparticles in the constant temperature reaction zone, the microparticle trajectory is extended by twenty times through helical pipes. A carbon coating of nanoscale thickness (~ 400 nm) was prepared on the surface of ceramic microparticles using fluidized bed-chemical vapor deposition with a facile design. The microstructure, formation mechanism, bonding mode, and property of the coating were studied. The results show that the coating first forms small spherical carbon and then forms spherical shell coating. Furthermore, the carbon atoms in the coating are combined with the oxygen atoms in the ceramic microparticle. The carbon coating of nanoscale thickness can serve as a barrier to protect ceramic microparticles from long-term corrosion (5 days) by pure hydrofluoric acid.

Keywords

FB-CVD; Coated ceramic microparticles; Residence time; Corrosion resistance

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