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Synthesis of La0.8Sr0.05Ca0.15Fe0.8Co0.2O3-δ -Ce0.9Gd0.1O1.95 Composite Cathode Material for Solid Oxide Fuel Cell with Lanthanum and Cerium Recycled from Wasted Glass Polishing Powder

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Abstract : Processing of flat-panel displays generates huge amount of wasted glass polishing powder, with high concentration of cerium and other elements such as lanthanum. According to the current statistics, consumption of polishing powder was approximately ten thousand tons per year in the world. Nevertheless, wasted polishing powder was usually buried or burned. If the lanthanum and cerium compounds in the wasted polishing powder could be recycled, that will greatly reduce enterprise cost and implement waste circulation. Cathodes of SOFCs are the principal consisting of rare earth elements such as lanthanum and cerium. In this study, we recycled the lanthanum and cerium from wasted glass polishing powder by acid-solution method, and synthesized La0.8Sr0.05Ca0.15Fe0.8Co0.8O3-δ and Gd0.1Ce0.9O2 (LSCCF-GDC) composite cathode material for SOFCs by glycinenitrate combustion (GNP) method. The results show that the recovery rates of lanthanum and cerium could accomplish up to 80% and 100% under 10N nitric acid solution within one hour. Comparing with the XRD data of the commercial LSCCF-GDC powder and the LSCCF-GDC product synthesized with chemicals, we find that the LSCCF-GDC was successfully synthesized with the recycled La & Ce solution by GNP method. The effect of adding ammonia to the product was also discussed, the grain size is finer and recovery rate of the product is higher without the addition of ammonia to the solution.

Keywords : glass polishing powder, acid solution, recycling, composite cathodes of solid oxide fuel, cell (SOFC), perovskite, glycine-nitrate combustion(GNP) method
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