

研究论文

## 新型固体电解质 $Ce_{5.2}RE_{0.8}MoO_{15-\delta}$ 的合成及电性质

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**摘要** 采用溶胶-凝胶方法合成了系列新型氧化物 $Ce_{5.2}RE_{0.8}MoO_{15-\delta}$ ( $RE=Ce, Y, La, Sm, Gd, Dy, Ho, Er$ ). 通过XRD, Raman和XPS等手段对氧化物的结构进行了表征, 采用交流阻抗谱测试其导电性能. 研究表明,  $RE^{3+}$ 的掺杂可增加氧离子的空位浓度, 改善母体电导率, 晶胞参数随 $RE^{3+}$ 半径的增大而增大. 掺杂离子 $Dy^{3+}$ 的半径(0.0908 nm)与母体基质离子 $Ce^{4+}$ 的半径(0.0920 nm)相近, 形成的掺杂氧化物晶格弹性应变最小,  $RE^{3+}$ 与氧空位间的缔合焓( $\Delta H_A$ )最小, 因而氧化物 $Ce_{5.2}Dy_{0.8}MoO_{15-\delta}$ 具有相对较高的电导率( $7.02 \times 10^{-3}$  S/cm)和较低的激活能(1.056 eV).

**关键词** [固体电解质](#) [电导率](#) [溶胶-凝胶法](#) [固体氧化物燃料电池](#)

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## Synthesis and Electrical Properties of New Solid State Electrolyte Materials $Ce_{5.2}RE_{0.8}MoO_{15-\delta}$

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**Abstract** A series of solid state electrolytes,  $Ce_{5.2}RE_{0.8}MoO_{15-\delta}$ ( $RE=Y, La, Sm, Gd, Dy, Ho, Er$ ), were synthesized by sol-gel method. Their structures and electrical conductivities were characterized by X-ray Diffraction(XRD), Raman and X-ray Photoelectron Spectroscopy(XPS) and AC impedance spectroscopy, respectively. The results show that the concentrations of oxygen vacancy increased with increasing  $x$  and their conductivity were improved. And the cell parameter  $s$  increase as the radius of  $RE^{3+}$  increases. Because the ionic radius of doped  $Dy^{3+}$  (0.0908 nm) is closed to that of  $Ce^{4+}$  (0.0920 nm), their oxide has minimal cell elastic straining between  $RE^{3+}$  and oxygen vacancy, and the system has the least association enthalpy, thus the oxide  $Ce_{5.2}RE_{0.8}MoO_{15-\delta}$  exhibits a higher conductivity( $7.02 \times 10^{-3}$  S/cm) and lower activation energy(1.056 eV) compared to the other doped compounds.

**Key words** [Solid state electrolyte](#) [Conductivity](#) [Sol-gel method](#) [SOFCs](#)

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