

Electrical properties of various composition of yttrium doped-zirconia prepared from local zircon sand

Fitria Rahmawati, author

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Abstrak

Doping yttrium ions, Y^{3+} into ZrO_2 produced Ytria-Stabilized Zirconia, YSZ. Various amount of yttrium ions could provide different ionic conductivity. This research investigated electrical conductivity of various YSZ composition, i.e., 4.5; 8.0 and 10% mol yttrium in ZrO_2 . The ZrO_2 powder used was synthesized from zircon sand, a side product of tin mining plant, Bangka Island, Indonesia. Structural investigation on the prepared YSZ found that yttrium ion doping has changed the crystal structure of ZrO_2 from monoclinic to cubic, even though the monoclinic and tetragonal are also still exist. The Y^{3+} doping changed the cell parameter of ZrO_2 crystal. It indicates that the Y^{3+} entered into the ZrO_2 structure and produced vacancy sites. The highest ionic conductivity is provided by 8% mol Yttrium doping or 8YSZ, i.e., $2.74 \times 10^{-4} \text{ S.cm}^{-1}$ at 700oC with an activation energy of 0.741 eV.