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

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Abstrak

Doping yttrium ions, Y3+ into ZrO2 produced Yttria-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 ZrO2. The ZrO2 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 ZrO2 from monoclinic to cubic, even though the monoclinic and tetragonal are also still exist. The Y3+ doping changed the cell parameter of ZrO2 crystal. It indicates that the Y3+ entered into the ZrO2 structure and produced vacancy sites. The highest ionic conductivity is provided by 8% mol Yttrium doping or 8YSZ, i.e., 2.74×10-4 S.cm-1 at 700oC with an activation energy of 0.741 eV.