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Preparation and Electrical Properties of Hydroxyapatite Containing Yttrium

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PREPARATION AND ELECTRICAL PROPERTIES OF HYDROXY- APATITE CONTAINING YTTRIUM

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Hydroxyapatite (HAp) containing yttrium ion was synthesized and sintered for obtaining apatite ceramics with new functional properties. The preparation of the ceramics was carried out by synthesis using the wet process and by sintering under water vapor atmosphere. The product was recognized to be a solid solution. By substituting Y for Ca, O^{2-} and lattice defect (\square) will form as follows: $OH^- \rightarrow O^{2-} + H_2O + \square$. Then, a following formula can be described for this solid solution produced:

$Ca_{10-x}Y_x(PO_4)_6(OH)_{2-x-2y}O_{x+2y}\square_y$. The ionic conductivity of the product was measured by the ac two probe method. The plot of conductivity-Y content relation gave a characteristic curve with a sharp peak at a fixed composition, $Y=0.65$. It was considered that this tendency was due to a change in the charge carrier in HAp crystal from OH^- to H^+ and O^{2-} with varying Y content. Electromotive force was observed in a water vapor cell assembled using the phosphate ceramics, and hydrogen gas generation was recognized. These phenomena led a fact that proton conduction exists in the ceramics. It was concluded that this ceramics will be used as a fuel cell.