Fabrication of Titanium Dioxide Supports for Ceramics Membranes used in the Treatment of Nuclear Waste

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OBJECTIVE

Investigate the effect of the concentration of potato starch as a pore forming agent by measures of porosity in ceramic pellets by gamma transmission spectroscopy.

METHODOLOGY

$\rightarrow$ Total Porosity

$$P_t = \frac{\mu_a - \mu_b}{\mu_a} \cdot 100\%$$  \hspace{1cm} \text{Eq. 1}

where: $\mu_a$ = attenuation coefficient of free pore material; $\mu_b$ = attenuation coefficient of the material subjected to gamma radiation beam.

Fig. 1 - Experimental arrangement of gamma radiation transmission system. (1) lead shield. (2) radioactive source. (3) collimator. (4) sample. (5) scintillator detector. (6) pre-amplifier. (7) multichannel. (8) computer for data acquisition by software. (9) removable media for data storage.
RESULTS AND DISCUSSION

Tab. 1 - Porosity values as a function of pore forming agent concentration.

<table>
<thead>
<tr>
<th>Potato Starch (% pp)</th>
<th>Porosity by Gamma (%)</th>
<th>Geometric Porosity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>54.096 ± 8.546</td>
<td>49.683 ± 0.014</td>
</tr>
<tr>
<td>5</td>
<td>57.134 ± 7.946</td>
<td>50.006 ± 0.014</td>
</tr>
<tr>
<td>10</td>
<td>54.913 ± 8.775</td>
<td>49.597 ± 0.014</td>
</tr>
</tbody>
</table>

→ The experimental uncertainty in gamma spectroscopy method is high due to the use of only three regions for the calculation of the porosity.