Effect of Texture on Microstructural Developments: Some Case Studies

Dr. S. K. Sahoo
Dept. of Metallurgical & Materials Engg, NIT Rourkela
The influence of texture on material properties is, in many cases, 20-50% of the property values.

1 Single-Phase Zircaloy 2
2 Two-Phase Zr-2.5Nb
3 Cold Rolled Non-Oriented (CRNO) Steel
Zircaloy 2

recrystallized

20% rolled

100µm

50% rolled

Fragmenting & Non-fragmenting grains

non-

undeformed

deformed

fragmenting

fragmenting

Residual Stress ODF

\[ \varphi_1 (0.0^\circ - 90.0^\circ) \]

\[ \Phi (0.0^\circ - 90.0^\circ) \]

Constant Angle: \( \varphi_2 = 0 \)
Twinned grain (twinning parent)

Twinning product/daughter

Untwinned
Twinning is orientation sensitive ... and it has strong influence on deformed microstructure.
Initial Dislocation Structure

Basal

Non-basal

Final Dislocation Structure

200°C
Zr-2.5Nb Alloy

B: Bulging Phase Boundary,
NB: Non-bulging Phase Boundary

Effect of 2nd phase hardness
30% deformed

![Graphs showing the average grain size vs. percentage compression for two samples, labeled as Sample A and Sample B.](image)

- **Hard β**: Images of microstructures are shown.
- **Soft β**: Images of microstructures are shown.

- **Diagram (a)**: Comparison of average grain size for Sample A and Sample B against percentage compression.
- **Diagram (b)**: Comparison of average grain size for Sample A and Sample B against percentage compression.
CRNO Steel

Graph showing area fraction vs. grain size for A1 and A2.

Graph showing misorientation angle vs. degree for A1 and A2.
### Table of Magnetic Properties

<table>
<thead>
<tr>
<th>Samples</th>
<th>Theta fiber (volume fraction)</th>
<th>Goss Orientation (volume fraction)</th>
<th>Cube Orientation (volume fraction)</th>
<th>Core Loss (watt/kg)</th>
<th>Magnetic Permeability</th>
<th>Relative Importance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1-0</td>
<td>0.117</td>
<td>0.0596</td>
<td>0.05</td>
<td>3.97</td>
<td>1417.94</td>
<td>98</td>
</tr>
<tr>
<td>A1-30</td>
<td>0.128</td>
<td>0.0165</td>
<td>0.0379</td>
<td>5.07</td>
<td>999.53</td>
<td>54</td>
</tr>
<tr>
<td>A1-60</td>
<td>0.136</td>
<td>0.023</td>
<td>0.0469</td>
<td>4.67</td>
<td>1443.6</td>
<td>85</td>
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<tr>
<td>A1-90</td>
<td>0.146</td>
<td>0.0461</td>
<td>0.0379</td>
<td>4.38</td>
<td>1409.03</td>
<td>88</td>
</tr>
<tr>
<td>A2-0</td>
<td>0.121</td>
<td>0.0479</td>
<td>0.0353</td>
<td>3.74</td>
<td>1512.53</td>
<td>100</td>
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<tr>
<td>A2-30</td>
<td>0.144</td>
<td>0.0172</td>
<td>0.0487</td>
<td>4.02</td>
<td>970.65</td>
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<tr>
<td>A2-60</td>
<td>0.148</td>
<td>0.0163</td>
<td>0.0544</td>
<td>3.75</td>
<td>817.99</td>
<td>54</td>
</tr>
<tr>
<td>A2-90</td>
<td>0.134</td>
<td>0.0363</td>
<td>0.0344</td>
<td>4.26</td>
<td>1414.07</td>
<td>82</td>
</tr>
</tbody>
</table>
Thank you!