We Bleed Orange, Green, & Blue: Rapid microwave synthesis of advanced pigments
Omar Rachdi, Casey Young, Sean Muir, and M. A. Subramanian
Department of Chemistry, Oregon State University, Corvallis, OR 97331

Pigments: Old & New

- Egyptian Blue
- Cobalt Blue
- Vermillion
- Viridian green
- CaCuSiO$_{10}$
- CoAl$_2$O$_4$
- HgS
- Cr$_2$O$_3$

Pigments have been used from ancient to modern times.

Alchemists once led the search for new and beautiful colors.

Today, scientists lead the search for more durable, abundant, and safe pigments.

Progression of a Solid State Reaction

X-Ray Diffraction Patterns for YCu$_{0.5}$Ti$_{0.5}$O$_3$

<table>
<thead>
<tr>
<th>Compound</th>
<th>a(Å)</th>
<th>c(Å)</th>
<th>c/a</th>
<th>Volume (Å$^3$)</th>
<th>Heating Time (min)</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>YCu$<em>{0.5}$Ti$</em>{0.5}$O$_3$</td>
<td>6.172</td>
<td>11.470</td>
<td>1.858</td>
<td>378.40</td>
<td>2880</td>
<td>[1]</td>
</tr>
<tr>
<td>YIn$<em>{0.95}$Mn$</em>{0.05}$O$_3$</td>
<td>6.257(1)</td>
<td>12.172(3)</td>
<td>1.945</td>
<td>412.79</td>
<td>110</td>
<td>[2]</td>
</tr>
<tr>
<td>YIn$<em>{0.8}$Fe$</em>{0.2}$O$_3$</td>
<td>6.246(1)</td>
<td>12.203(2)</td>
<td>1.954</td>
<td>412.37</td>
<td>35</td>
<td>[3]</td>
</tr>
</tbody>
</table>

Conclusions

Microwave synthesis can be used to rapidly make advanced pigments based on trigonal bipyramidal coordination.

The crystal structure of these materials agrees well with previous reports using traditional furnace based methods.

The color of these materials have been quantified using UV/VIS reflectance spectroscopy.

Acknowledgments & References

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