NaCl

<table>
<thead>
<tr>
<th>2θ</th>
<th>θ (deg)</th>
<th>θ (rad)</th>
<th>sin^2θ</th>
<th>M^2</th>
<th>Miller Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27.3</td>
<td>0.473</td>
<td>0.056</td>
<td>3</td>
<td>111</td>
</tr>
<tr>
<td>2</td>
<td>31.68</td>
<td>0.541</td>
<td>0.075</td>
<td>4</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>45.42</td>
<td>0.789</td>
<td>0.149</td>
<td>8</td>
<td>220</td>
</tr>
<tr>
<td>4</td>
<td>53.92</td>
<td>0.915</td>
<td>0.206</td>
<td>11</td>
<td>311</td>
</tr>
<tr>
<td>5</td>
<td>56.44</td>
<td>0.983</td>
<td>0.224</td>
<td>12</td>
<td>222</td>
</tr>
</tbody>
</table>

**PEAK DIFFERENCES**

\[
\sin^2 \theta_2 - \sin^2 \theta_1 = \frac{\lambda^2}{4a^2(M_2^2-M_1^2)}
\]

\[
\begin{array}{|c|c|c|c|c|}
\hline
\theta_2-\theta_1 & \text{difference} & \text{int.} & \text{M}^2-\text{M}^2 \\
\hline
2-1 & 0.019 & 1 & 4-3 \\
3-2 & 0.075 & 4 & 8-4 \\
4-3 & 0.056 & 3 & 11-8 \\
5-4 & 0.018 & 1 & 12-11 \\
6-5 & -0.224 & -12 & 16-12 \\
\hline
\end{array}
\]

\[
\begin{align*}
a &= 5.63 \times 10^{-10} \text{ m} \\
V &= 1.78 \times 10^{-28} \text{ m}^3 \\
density &= \text{use MW to calculate} \\
MW &= 58.44 \text{ g/mol} \\
\text{Molecules/unit cell:} &= 4
\end{align*}
\]

**Yellow**

Color Centers - particle in a box:

\[
E_n = \frac{(1.05 \times 10^{-34})^2 \pi^2 n^2}{2(9.1 \times 10^{-31})^2 (5.63 \times 10^{-10})^2}
\]

\[
E_n = 3.54 \text{ eV} \quad 1.6 \times 10^{-19} \text{ J/eV}
\]

\[
E_n = 3.51 \times 10^{-7} \text{ m} \quad \lambda = \frac{hc}{E_n}
\]

\[
\lambda = 350.97 \text{ nm}
\]

Your wavelength may off the color you observed. Come up with so
me reason why (see refs)