

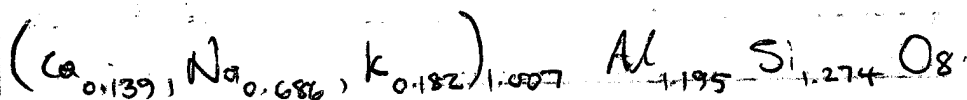
# GLT 251 - Crystal Chemistry and Optics

## Practical Questions.

Try a feldspar.

|                                | Wt-%   | mol-wt  | mol-prop | cation-equ | oxide-equ | coefficients |
|--------------------------------|--------|---------|----------|------------|-----------|--------------|
| SiO <sub>2</sub>               | 43.550 | 60.084  | 0.7248   | 0.7248     | 1.4496    | 1.274        |
| Al <sub>2</sub> O <sub>3</sub> | 34.660 | 101.961 | 0.3399   | 0.6798     | 1.0197    | 1.195        |
| CaO                            | 4.440  | 56.077  | 0.0792   | 0.0792     | 0.0792    | 0.139        |
| Na <sub>2</sub> O              | 12.090 | 61.979  | 0.1951   | 0.3902     | 0.1951    | 0.686        |
| K <sub>2</sub> O               | 4.820  | 94.195  | 0.0517   | 0.1034     | 0.0517    | 0.182        |
| Total                          | 99.610 |         |          |            | 4.5512    |              |

$$8/4.5512 = 1.7578$$



Accordingly a feldspar should have the coefficients of  $Al + Si = 4$  and  $Ca + Na + K = 1$ . In this case the end members  $Ca$ ,  $Na$ , and  $K$  are equal to 1.007, but the ratio  $Al$  and  $Si$  are equal to 2.469.

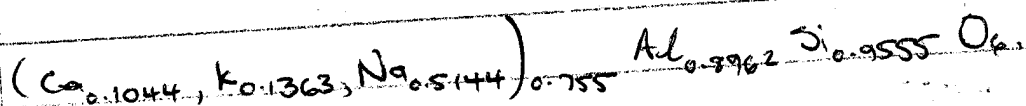
This analysis is therefore not a feldspar.

Try = pyroxene (leucite).

|                                | wt-%   | mol-wt  | mol prop | cation eqn | oxide eqn | coefficients |
|--------------------------------|--------|---------|----------|------------|-----------|--------------|
| SiO <sub>2</sub>               | 43.550 | 60.084  | 0.7248   | 0.7248     | 1.4496    | 0.9555       |
| Al <sub>2</sub> O <sub>3</sub> | 34.660 | 101.961 | 0.3399   | 0.6798     | 1.0197    | 0.8962       |
| CaO                            | 4.440  | 56.077  | 0.0792   | 0.0792     | 0.0792    | 0.1044       |
| Na <sub>2</sub> O              | 12.090 | 61.979  | 0.1951   | 0.3902     | 0.1951    | 0.5144       |
| K <sub>2</sub> O               | 4.870  | 94.195  | 0.0517   | 0.1034     | 0.0517    | 0.1363       |
| Total                          | 99.610 |         |          |            | 4.5512    |              |

Al  
Fe  
M  
T

$$6/4.5512 = 1.3183$$



leucite is a pyroxene with mineral formula  $KAlSi_2O_6$ ,  
our Si is 0.9555 and not approximating 2. This  
analysis therefore is not a leucite.

My conclusion is that this analysis is something else as  
it does not fit the formula for feldspar or leucite.

3.

|                                | wt-%   | mol. wt                             | mol prsp                    | cation eqv | oxide eqv | coefficients |
|--------------------------------|--------|-------------------------------------|-----------------------------|------------|-----------|--------------|
| Al <sub>2</sub> O <sub>3</sub> | 19.050 | <del>50.987</del><br>101.961        | <del>0.3737</del><br>0.1868 | 0.3737     | 0.5604    | 0.8399       |
| FeO                            | 52.052 | 71.85                               | 0.7245                      | 0.7245     | 0.7245    | 1.6288       |
| MgO                            | 16.200 | 40.3                                | 0.40196                     | 0.40196    | 0.40196   | 0.9037       |
| NiO                            | 6.900  | <sup>693</sup><br><del>74.963</del> | 0.0924                      | 0.0924     | 0.0924    | 0.2077       |
| Total                          | 94.202 |                                     |                             |            | 1.77926   | 4.           |

$$4 / 1.77926 = 2.2481$$

Revised analysis

|                                | cation eqv | Fe <sup>3+</sup> cations | charge |
|--------------------------------|------------|--------------------------|--------|
| Al <sub>2</sub> O <sub>3</sub> | 0.3736     | 0.7038                   | 2.1114 |
| FeO                            | 0.7245     | 1.3649                   | 2.7298 |
| MgO                            | 0.40196    | 0.7572                   | 1.5144 |
| NiO                            | 0.0924     | 0.17407                  | 0.3481 |
|                                | 1.59246    | 3.0000                   | 6.7037 |

$$\text{Factor} = 1.8839$$

$$8 - 6.7037 = 1.2963 \text{ Fe}^{3+} \text{ deficit}$$

$$\text{Fe}^{2+} = 1.3649 - 1.2963 = 0.0686$$

$$\therefore \text{FeO} = 0.0686 / 1.8839 * 71.85 = 2.616 \%$$

$$\text{FeO}_{1.5} = 1.2963 / 1.8839 * 77.846 = 54.91\% \quad \text{54.91\%}$$

$$\left( \text{Fe}^{3+}_{1.296}, \text{Al}_{0.8399} \right)_{2.1095} \left( \text{Fe}^{2+}_{0.0686}, \text{Mg}_{0.9037}, \text{Ni}_{0.2077} \right)_{1.18} \text{O}_4$$

|                                | wt-%                       |
|--------------------------------|----------------------------|
| Al <sub>2</sub> O <sub>3</sub> | 19.050                     |
| FeO                            | 2.616                      |
| Fe <sub>2</sub> O <sub>3</sub> | <del>47.437</del><br>54.91 |
| MgO                            | 16.200                     |
| NiO                            | 6.900                      |
| Total                          | 99.577                     |