**Plagioclase Group**

Solid solution between Albite $\Leftrightarrow$ Anorthite

$NaAlSi_3O_8$ $CaAl_2Si_2O_8$

At high temperature, $NaAlSi_3O_8$ is in a disordered state (high-albite or analbite). As T decreases, the Al becomes more ordered forming low-albite. The optical properties vary continuously with Al-Si ordering. In both cases, polysynthetic twinning will develop parallel to (010) and is termed albite twinning (Fig. 12.12 top). Sometimes a second twinning will develop on the rhombic section and is called pericline twinning. The twin planes in both cases are straight and regular and twinning is multiple. Simple twinning may also be present (Fig 12.12, middle). Several types of simple twins are possible. See Fig. 12.11 for some examples.

In plutonic rocks, plagioclase commonly occurs as lathe-shaped crystals. Plagioclase is very susceptible to alteration and will commonly be sericitized. Sericite is a very fine-grained white mica that is a common alteration product of plagioclase. Other alteration products include epidote and carbonates. In metamorphic rocks, twinning, more often than not, is absent. Plagioclase crystals will be anhedral.



Under crossed polars, plagioclase will also display zoning –

- continuous zoning – as the stage is rotated, there will be a change in extinction due to a regular change in anorthite content.
- discontinuous zoning (Fig 12.12, bottom) – also know as oscillatory zoning. This is usually due to oscillations in the anorthite content.

**Identification in thin section:**
Plane light – colorless, may be cloudy or dusty due to alteration.
Low positive or negative relief.
Crossed polars – commonly displays polysynthetic twinning and/or zoning. Biaxial (+) or (-) with variable 2V (See Fig 15.8).

**Identification in hand sample:**
The plagioclase feldspars can range in color from colorless to white to greenish yellow and even flesh red. They have a vitreous, pearly luster. Polysynthetic twinning is diagnostic of plagioclase. See hand sample 1844 as a good example of what to look for. The plagioclase feldspars show perfect {001} cleavage and good {010} cleavage.



**Minerals of the plagioclase series:**
Albite- $NaAlSi_3O_8$ end-member.
Oligoclase- Found in granodiorites and monzonites.
Andesine- Found as grains in andesites and diorites.
Labradorite- Common in gabbros and basalts. Recognized by the iridescent play of colors it displays.
Bytownite- Found as grains in gabbros.
Anorthite- $CaAl_2Si_2O_8$ end member.

**Determining Plagioclase composition**:
There are several ways to determine the anorthite content of plagioclase by using its optical properties. We will practice two of them.

A. Michel-Levy Method- Uses the property that the extinction angle measured to the (010) composition plane varies with composition. Two extinction angles are measured (see fig 12.15 and 12.16). For a detailed account, refer to Nesse, pg. 272.

B. The Carlsbad-Albite method – is a variant of the Michel-Levy method but requires only one properly oriented grain (rather than several grains as in the previous technique). See Nesse, p. 273 for a detailed account of how to perform this test.