



T.C.
Ankara Üniversitesi
Mühendislik Fakültesi
Jeoloji Mühendisliği Bölümü



JEM 227 GEMOLOJİ

Dr. Öğr. Üyesi Kıymet DENİZ

2. Hafta

2020-2021 Güz Dönemi

Bu ders notlarının hazırlanmasında Mefail Yenyol'un sunumlarından ve Mineraloji kitabından yararlanılmıştır.

KUVARS

PROFILE



Hexagonal



7



2.7



None



Conchoidal



White



Vitreous



Kimyasal Formülü

SiO_2

VARIANTS



Pyramidal amethyst

An amethyst specimen with pyramidal terminations



Smoky quartz Double-terminated smoky quartz in milky quartz



Milky quartz A white, terminated quartz prism



Oval citrine

This large, oval-cut citrine is set in a silver brooch. It is encircled by silver leaves and faceted amethysts.

Bonewitz, R. L. (2012)

Prismatic quartz
This group of long, prismatic quartz crystals is from the Dauphiné province of France.

KALSEDON

PROFILE



Hexagonal



7



2.7



None



Uneven



White



Waxy to dull

Kimyasal Formülü

SiO_2

VARIANTS



waxy luster

botryoidal habit

Pink chalcedony

This form of botryoidal pink chalcedony is sometimes referred to as a "chalcedony rose."

Bonewitz, R. L. (2012)

AGAT

PROFILE



Hexagonal



7



2.7



None



Conchoidal



White



Vitreous to waxy

concentric
bands of agate

shapes of bands
follow outline
of cavity

color variation
determined by
impurities present

Bonewitz, R. L. (2012)

Kimyasal Formülü

SiO_2

Brazilian agate

This cross section of a Brazilian agate nodule shows the concentric layering typical of agate.

JASPER

PROFILE



Hexagonal



7



2.7



None



Conchoidal



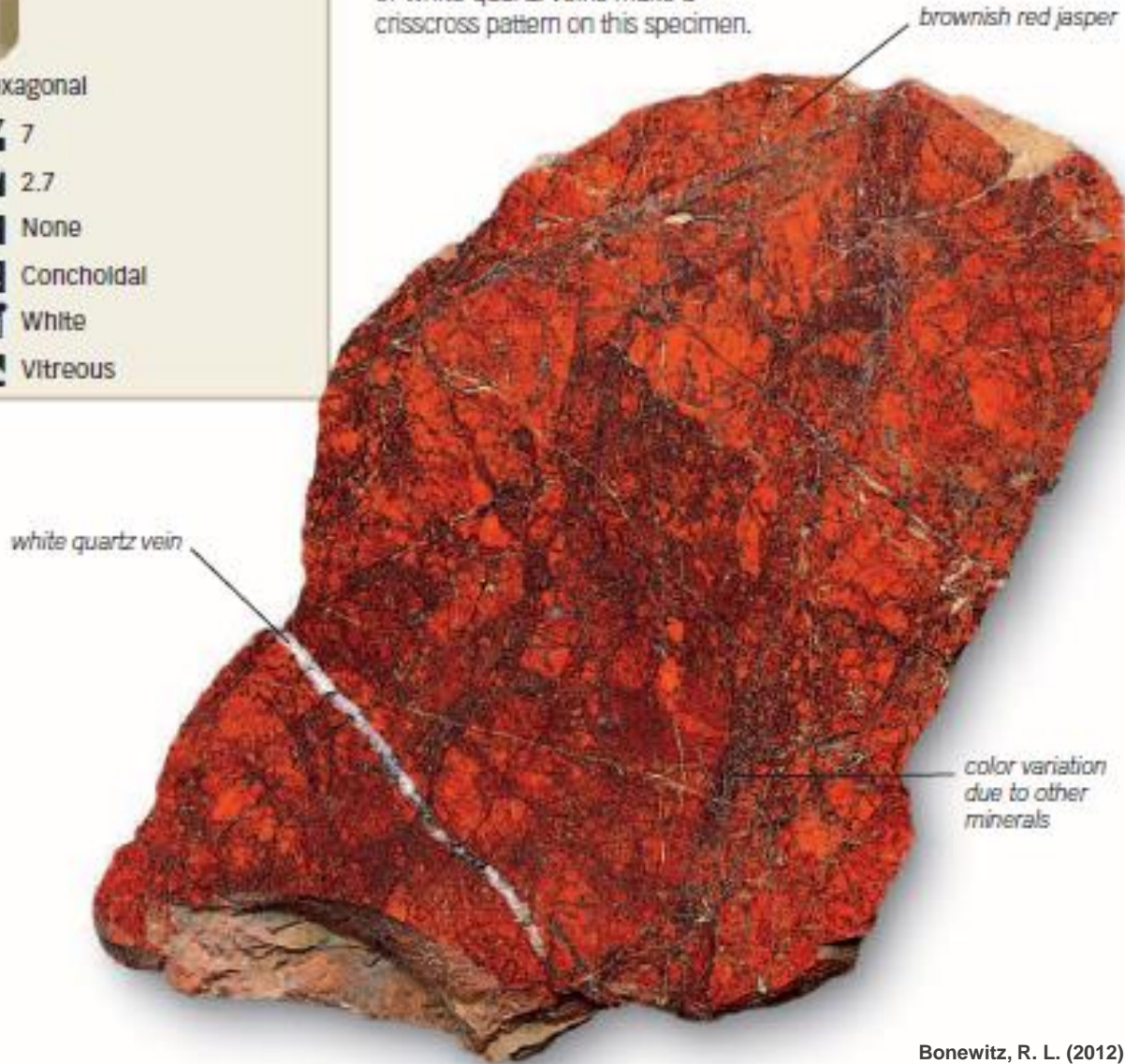
White



Vitreous

Color variation

Hematite colors this example of jasper brownish red. Threads of white quartz veins make a crisscross pattern on this specimen.



Bonewitz, R. L. (2012)

Kimyasal Formülü

SiO_2

OPAL

PROFILE

Crystal system Amorphous

5-6

1.9-2.3

None

Conchoidal

White

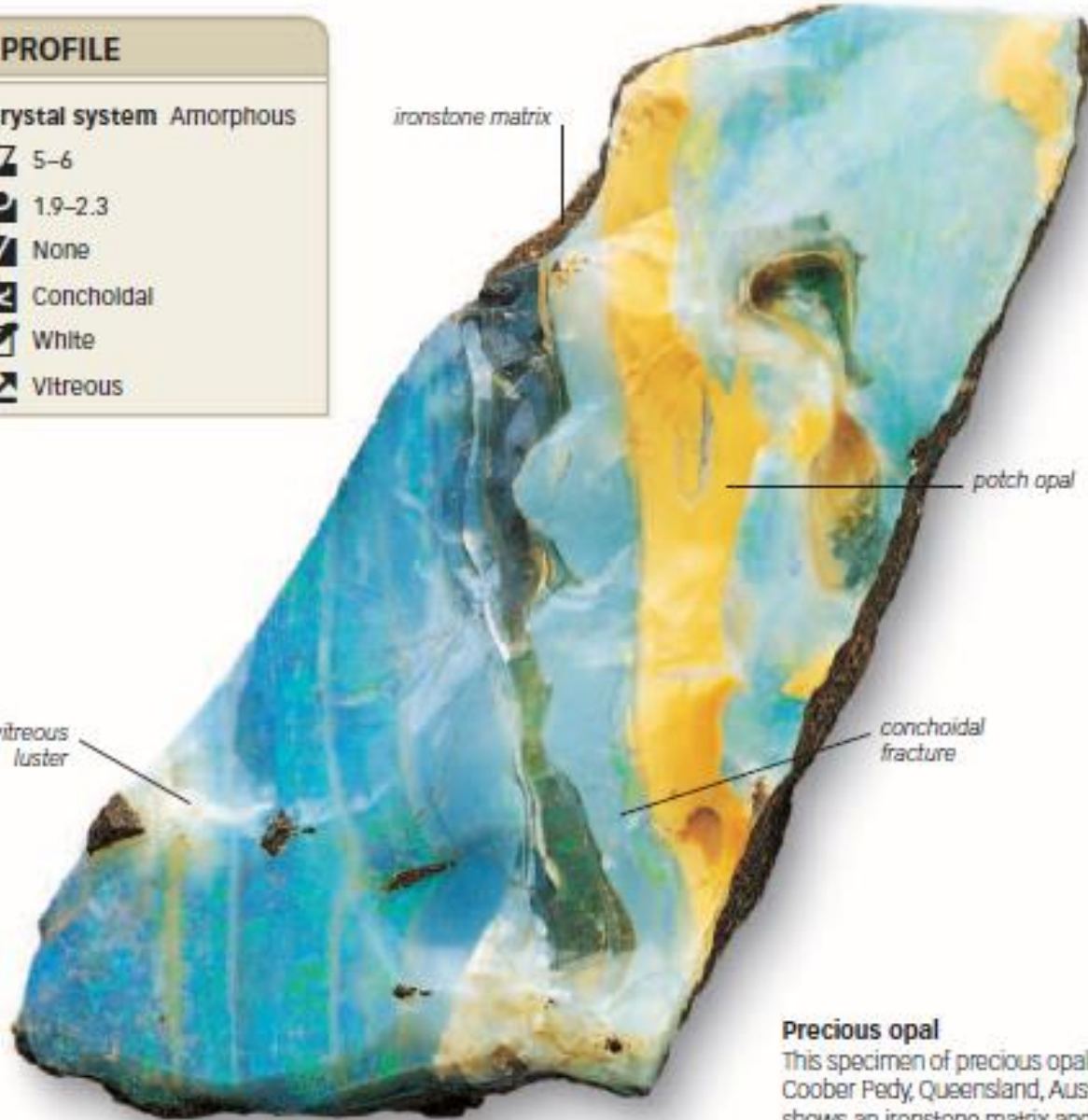
Vitreous

ironstone matrix

patch opal

conchoidal fracture

vitreous luster



Precious opal

This specimen of precious opal from Coober Pedy, Queensland, Australia, shows an ironstone matrix and streaks of yellowish patch opal.

Kimyasal Formülü

$\text{SiO}_2 \cdot n\text{H}_2\text{O}$



Victorian ring

Some cut opal dries and cracks with age and needs to be kept moist. The opal in this ring is well preserved.

ORTOKLAZ

PROFILE



Monoclinic



6-6½



2.5-2.6



Perfect



Subconchoidal to uneven, brittle



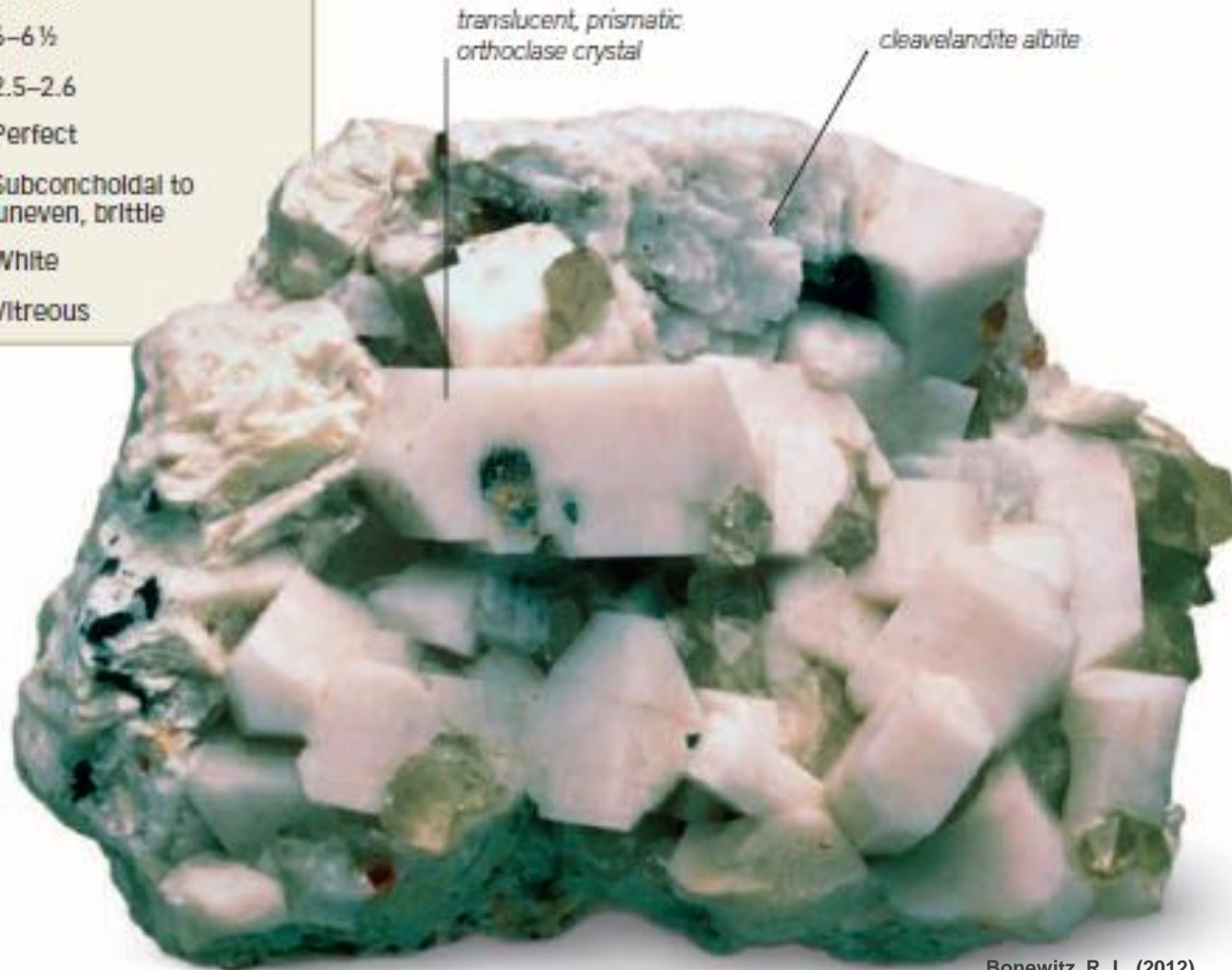
White



Vitreous

Orthoclase prisms

In this specimen, white, blocky prisms of orthoclase are associated with cleavelandite albite and set in pegmatite.



Bonewitz, R. L. (2012)

Kimyasal Formülü

KAlSi_3O_8

VARIANTS



Yellow orthoclase A crystal of yellow orthoclase



Moonstone rough An opalescent variety of orthoclase



Orthoclase crystals Twinned orthoclase with smaller prism



Moonstone-set brooch

Orthoclase exhibits the schiller effect which creates the shimmer seen on the moonstones in this brooch.

MİKROKLİN

PROFILE



Triclinic

6-6½

2.6

Perfect, good

Conchoidal to uneven, brittle

White

Vitreous, dull

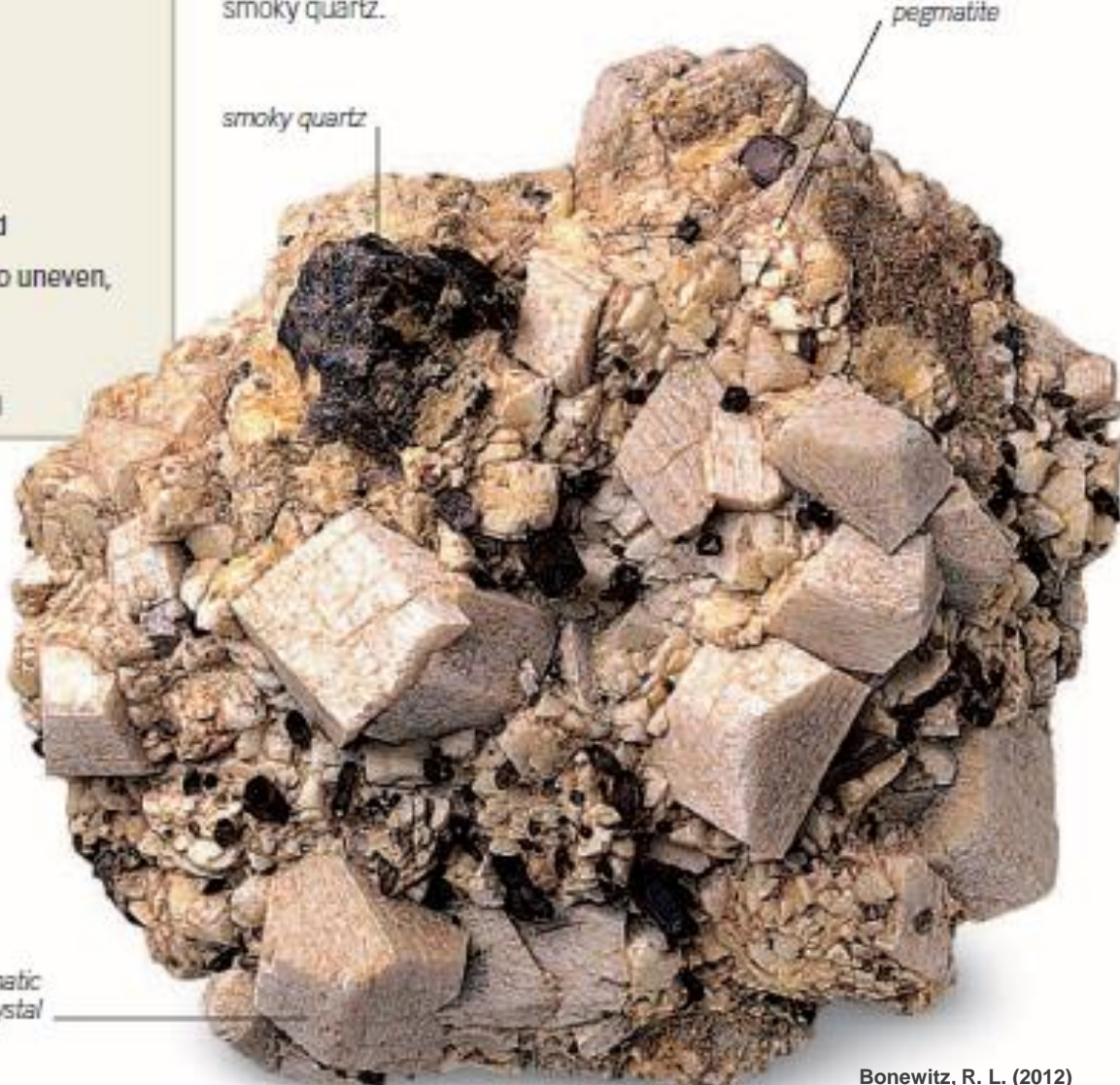
Prismatic microcline

Numerous prismatic crystals of light-colored microcline sit atop a pegmatite matrix, along with smoky quartz.

smoky quartz

pegmatite

blocky, prismatic crystal

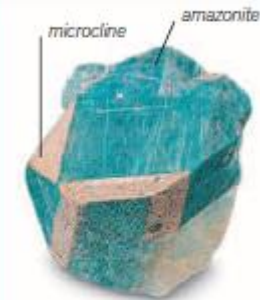


Bonewitz, R. L. (2012)

Kimyasal Formülü

$KAlSi_3O_8$

VARIANT



Amazonite A single crystal of blue-green amazonite, a variety of microcline



Amazonite cabochon

This Arts and Craft ring exhibits an asymmetrical set cabochon of amazonite in a rose-and-foilage design.

ALBİT

PROFILE



Triclinic



6-6½



2.6



Perfect, good



Conchoidal to uneven, brittle



White



Vitreous to pearly

twinned, tabular crystal

vitreous to pearly luster

Kimyasal Formülü

$\text{NaAlSi}_3\text{O}_8$

Tabular albite

This specimen consists of a large group of tabular, white albite crystals, many of which are twinned.



Facet-grade albite

Faceted albite, although fragile, is sometimes used in jewelry, along with albite's moonstone variety.

OLİGOKLAZ

PROFILE



Triclinic



6



2.6



Perfect



Conchoidal to
uneven, brittle



White



Vitreous

Massive oligoclase

This typical massive specimen of oligoclase is from Penland, Mitchell County, North Carolina.

vitreous luster

perfect cleavage

Kimyasal Formülü

$(\text{Na, Ca})\text{Al}_2\text{Si}_2\text{O}_8$



Semiprecious oligoclase

Sunstone oligoclase, such as the oval example seen here, has hematite or goethite inclusions.

Bonewitz, R. L. (2012)

LABRADOR

PROFILE



Triclinic

6–6½

2.7

Perfect

Uneven to conchoidal

White

Vitreous



Kimyasal Formülü

$(\text{Na, Ca})\text{Al}_2\text{Si}_2\text{O}_8$

VARIANTS



Schiller effect Orange, purple, and blue flashes visible in a specimen of labradorite



Orange sunstone Labradorite "sunstone" from Oregon



Semiprecious gemstone

The polished oval of labradorite in this choker beautifully displays the stone's rainbow iridescence.

Bonewitz, R. L. (2012)

SODALİT

PROFILE



Cubic

5½–6

2.1–2.3

Poor to distinct

Uneven to conchoidal

White to light blue

Vitreous to greasy

Massive sodalite

This sodalite specimen shows intense blue color, which can sometimes lead to the mineral being mistaken for lapis lazuli.

vitreous luster

uneven fracture

massive habit



Bonewitz, R. L. (2012)

Kimyasal Formülü

$(\text{Na}_4\text{Al}_3\text{Si}_3\text{O}_{12}\text{Cl})$

VARIANTS



Polished sodalite A specimen that has been polished to bring out its color



Indian sodalite A specimen of light blue sodalite found in India



Sodalite beads

This unusual modern Egyptian necklace has beads made of blue sodalite and red carnelian.

SERPANTİN

PROFILE



Monoclinic or triclinic

3½–5½

2.5–2.6

Perfect but not visible

Conchoidal to splintery

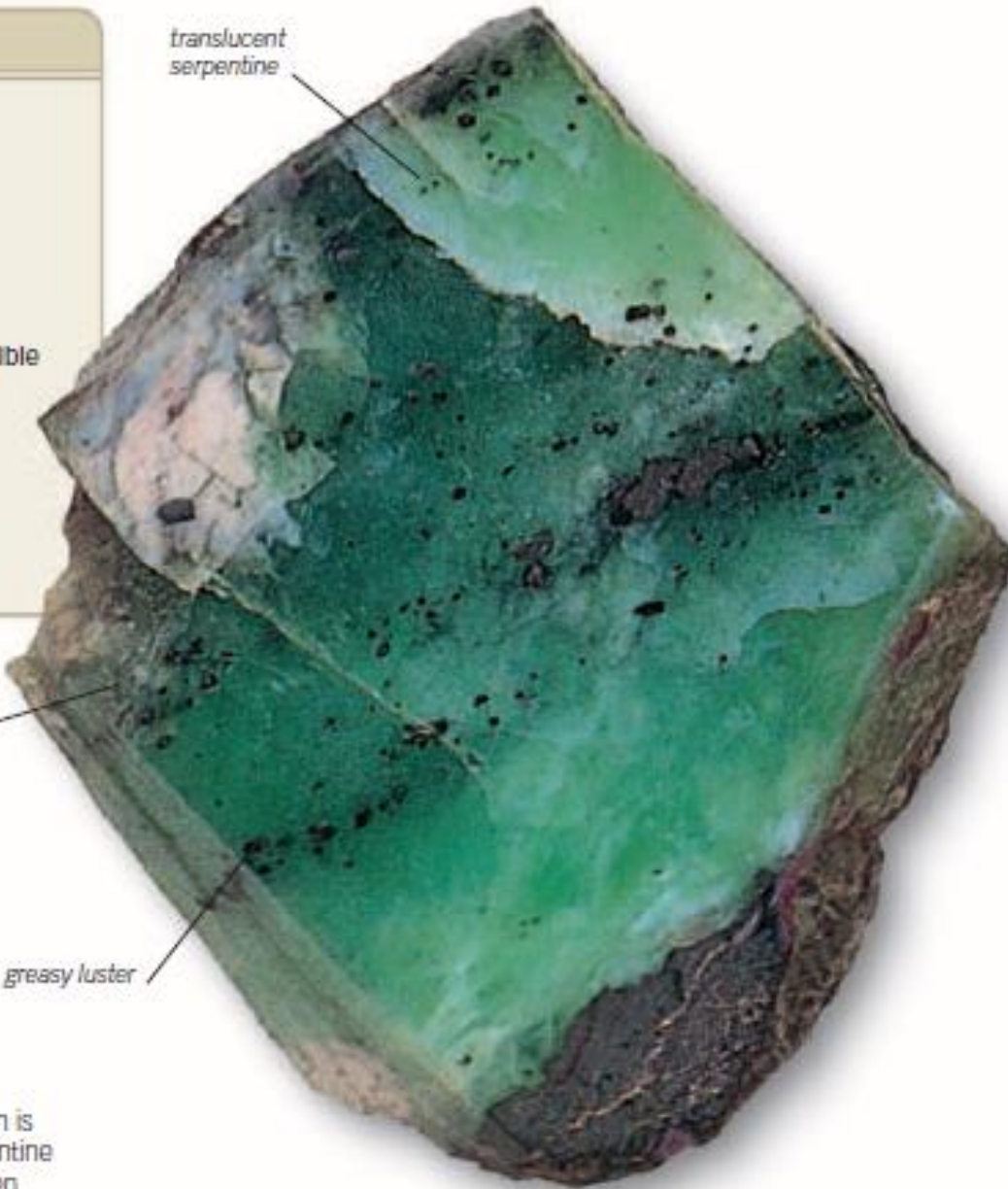
White

Subvitreous to greasy, resinous, earthy, dull

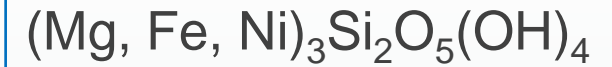
translucent serpentine

no visible cleavage

greasy luster



Kimyasal Formülü



VARIANTS



Lizardite A specimen of this fine-grained serpentine mineral from Cornwall, UK



Antigorite A specimen of this serpentine mineral with characteristic, corrugated plates



Williamsite cabochon
A variety of serpentine, williamsite is an ornamental stone that is sometimes cut as an inexpensive gem.

Bonewitz, R. L. (2012)

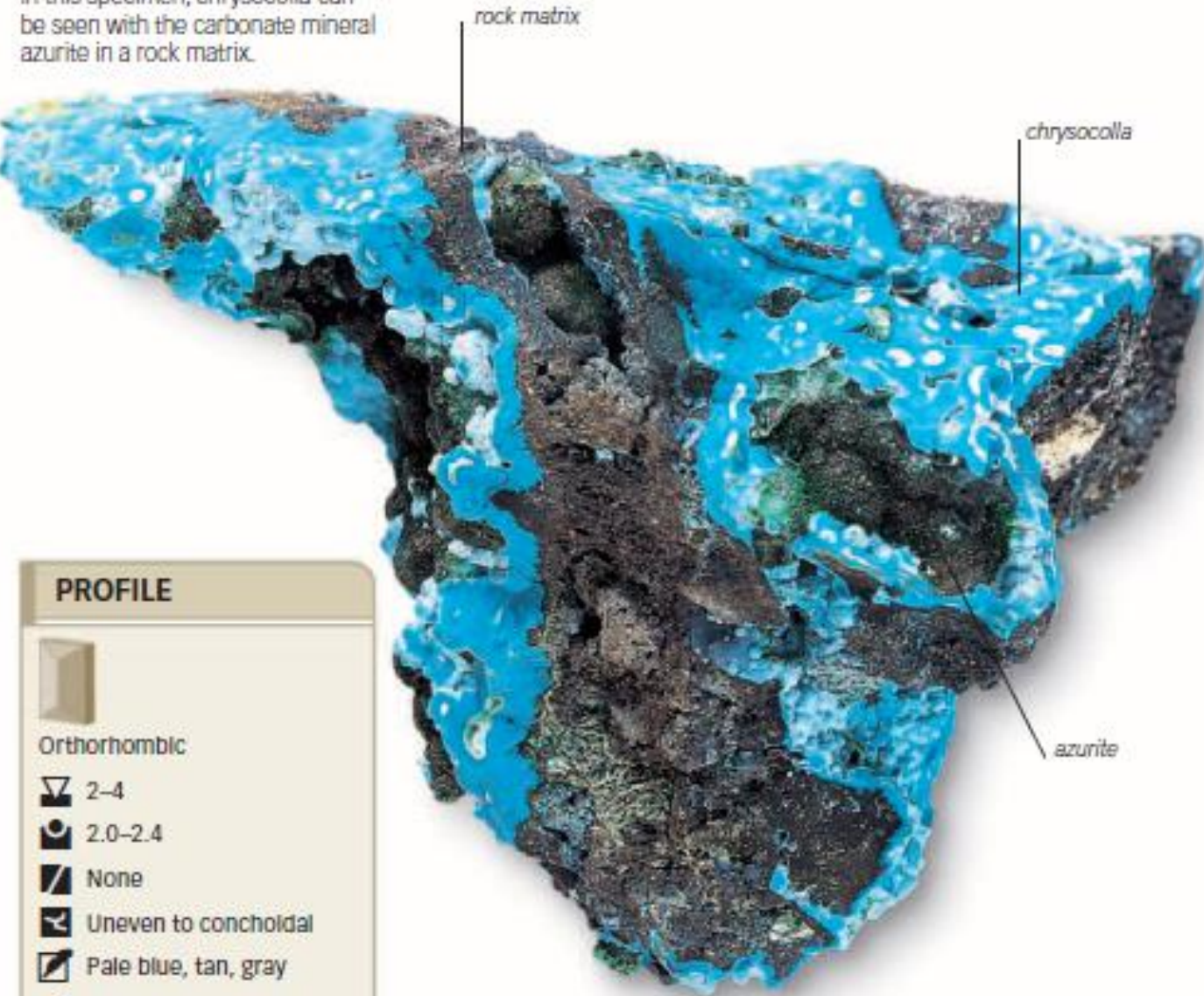
Precious serpentine

This high-quality specimen is composed of many serpentine minerals. It is the kind often carved and sold as jade.

KRİZOKOL

Chrysocolla with azurite

In this specimen, chrysocolla can be seen with the carbonate mineral azurite in a rock matrix.



PROFILE



Orthorhombic



2-4



2.0-2.4



None



Uneven to conchoidal

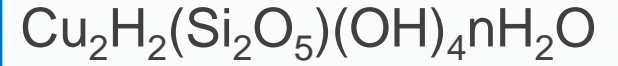


Pale blue, tan, gray



Vitreous to earthy

Kimyasal
Formülü



Chrysocolla bracelet

Rich blue-green chrysocolla, such as the cabochon in this antique bracelet, is highly prized as a gemstone.



Cabochon Green chrysocolla within reddish iron oxide

Bonewitz, R. L. (2012)

PREHNİT

PROFILE



Orthorhombic



6-6½



2.9



Distinct basal



Uneven, brittle



White



Vitreous

Botryoidal prehnite

A group of radiating crystal masses of prehnite resting on a rock matrix gives a botryoidal form to this specimen.



Kimyasal Formülü



White cabochon

Prehnite gems, such as this creamy white cabochon with dark inclusions, are almost too soft to wear.

Bonewitz, R. L. (2012)

ENSTATİT

PROFILE



Orthorhombic

5-6

3.1-3.9

Good to perfect

Uneven

Gray to white

Vitreous

Prismatic crystals

This mass of small, prismatic enstatite crystals rests on a rock matrix.



small, prismatic crystals

rock matrix

Kimyasal Formülü



Mixed-cut enstatite

Recovered from Myanmar and Sri Lanka, facet-grade enstatite, such as this gem, is mainly cut for collectors.

Bonewitz, R. L. (2012)

DIYOPSİT

PROFILE



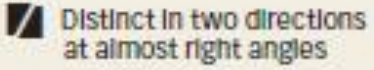
Monoclinic



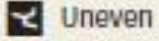
6



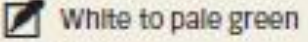
3.3



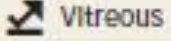
Distinct in two directions
at almost right angles



Uneven



White to pale green



Vitreous

Prismatic diopside

This specimen of diopside in a rock matrix comes from St. Marcel, Valle d'Aosta, Italy.

Kimyasal Formülü

$\text{CaMgSi}_2\text{O}_6$

quartz

prismatic
diopside crystal

rock
matrix



Chrome diopside

Emerald-green diopside, such as the gem shown here, is chromium-rich and is also known as chrome diopside.

NEFRİT

Polished nephrite

This small boulder of nephrite has been sliced and polished to reveal its quality.



PROFILE



Monoclinic

6½

2.9–3.4

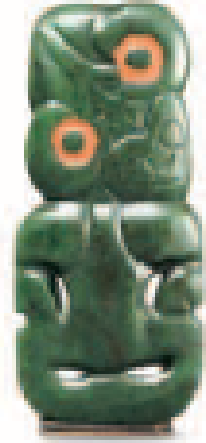
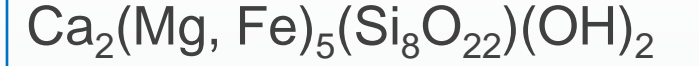
Perfect

Splintery, brittle

White

Dull to waxy

Kimyasal Formülü



Nephrite tiki

Hei tikis, such as this one made of nephrite, are worn by the Maori of New Zealand.



Light green nephrite A mass of light green nephrite.

RİBEKİT

PROFILE



Monoclinic



6



3.3-3.4



Perfect



Uneven



Blue-gray



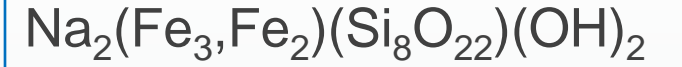
Vitreous, silky

group of prismatic crystals

Riebeckite crystals

The long, striated crystals characteristic of riebeckite are clearly visible in this specimen.

Kimyasal
Formülü



deep grayish
blue color

vertical, parallel
striations



Tiger's eye ring

Crocidolite, a variant of riebeckite, forms the gemstone tiger's eye when it is silica-saturated.

Bonewitz, R. L. (2012)

KORDİYERİT

PROFILE



Orthorhombic

7-7½

2.6

Moderate to poor

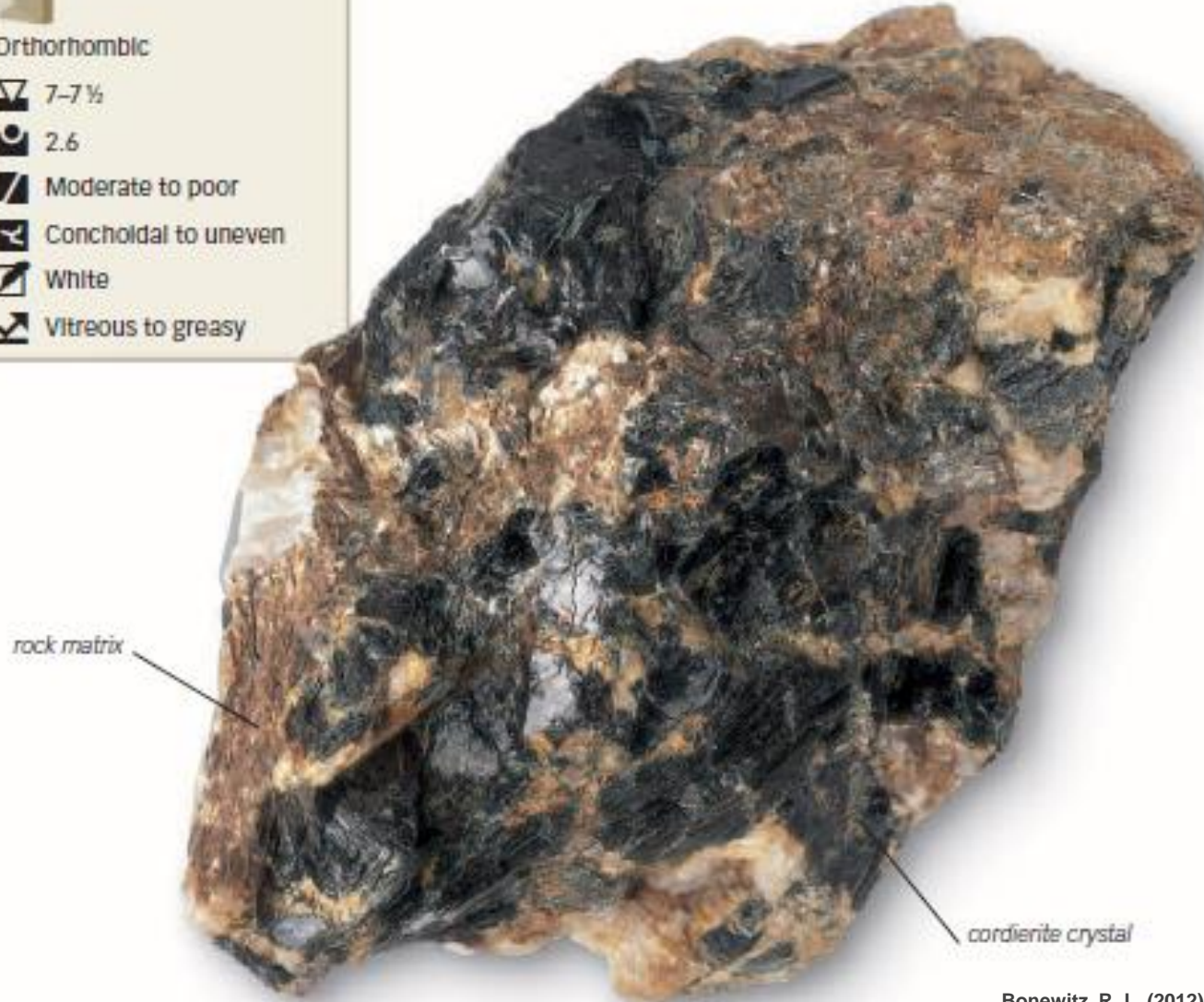
Conchoidal to uneven

White

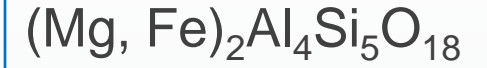
Vitreous to greasy

Cordierite crystals

This group of short prismatic, dark gray cordierite crystals occurs in a rock matrix.



Kimyasal
Formülü



Cordierite jewelry

A variety of cordierite, iolite is used in ornaments because of its color and brilliance.

Bonewitz, R. L. (2012)

AKSİNİT

PROFILE



Triclinic

6½–7

3.2–3.3

Good, poor

Uneven to conchoidal, brittle

Colorless to light brown

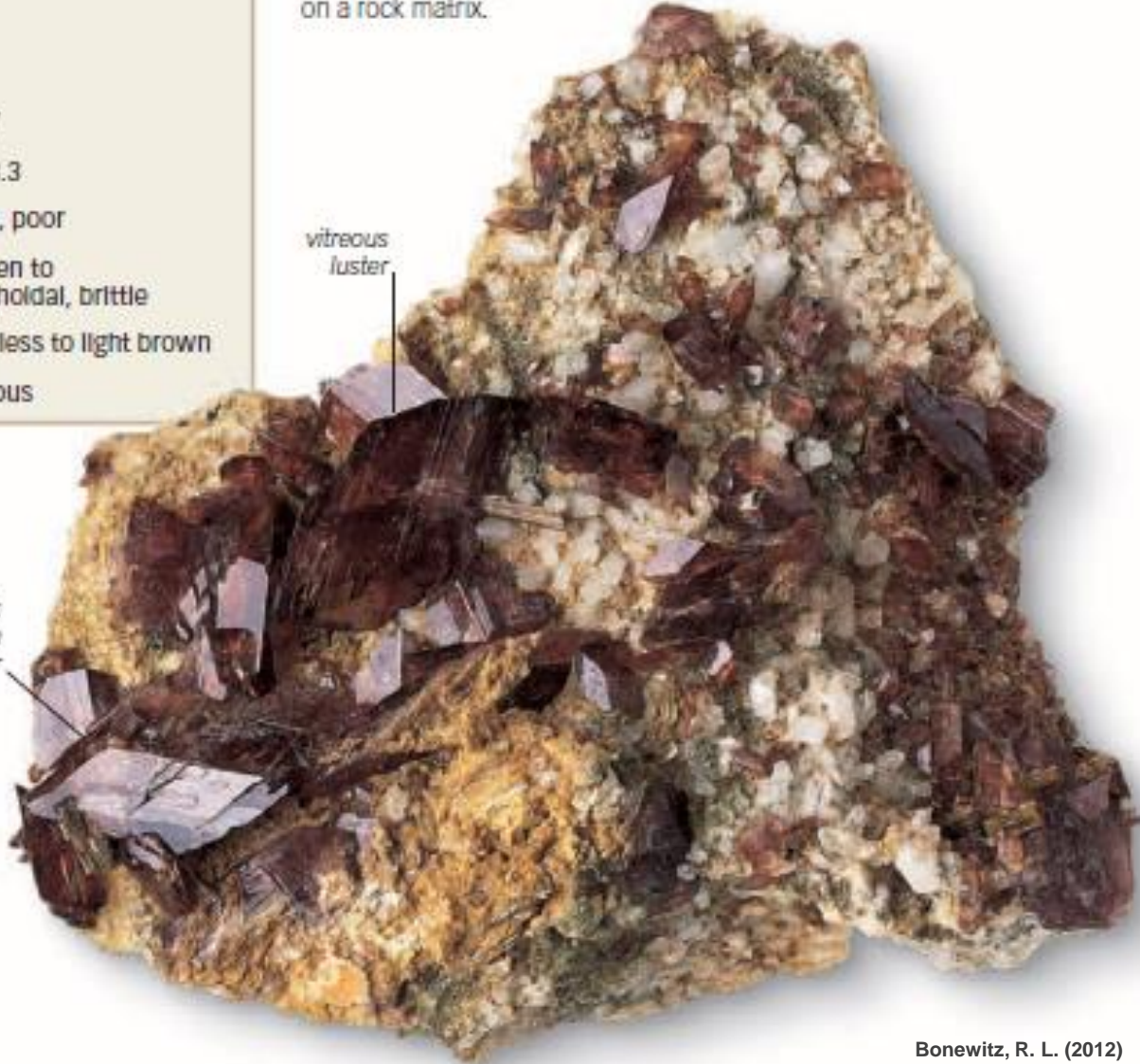
Vitreous

Axinite crystals

This mass of well-formed, transparent, wedge-shaped, tabular axinite crystals rests on a rock matrix.

vitreous luster

characteristic clove-brown color



Kimyasal Formülü

$\text{Ca}_2\text{FeAl}_2(\text{BSi}_4\text{O}_{15})(\text{OH})$



Axinite gemstone

Brilliant-cut axinite crystals, such as this specimen in an unusual shade of violet, are popular with collectors.

Bonewitz, R. L. (2012)

VEZÜVİYANİT

PROFILE



Tetragonal



Monoclinic

6½

3.4

Poor

Subconchoidal to uneven, brittle

White to pale greenish brown

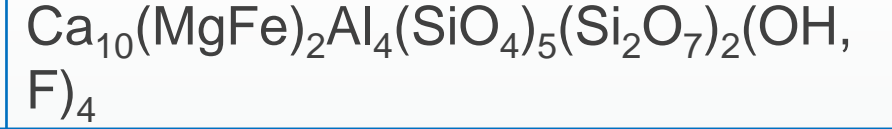
Vitreous to resinous

tetragonal crystal

vertical striation



Kimyasal Formülü



Vesuvianite gem

Occasionally, vesuvianite is found in translucent to transparent crystals suitable for cutting into gems.

Bonewitz, R. L. (2012)

Striated vesuvianite
This superb specimen consists of prismatic, vertically striated vesuvianite crystals.

EPIDOT

PROFILE



Monoclinic

6-7

3.4

Good

Uneven to splintery

Colorless or grayish

Vitreous

Epidote crystals

This superb group of striated epidote crystals, some reaching 1 in (2.5 cm) in length, shows typical prismatic development.

Kimyasal Formülü

$\text{Ca}_2\text{Al}_2(\text{FeAl})(\text{SiO}_4)(\text{Si}_2\text{O}_7)\text{O}(\text{OH})$



Epidote gemstone

Clear, yellowish green to dark brown epidote gems are rare. Transparent crystals are cut for collectors.

Bonewitz, R. L. (2012)

OLIVİN

PROFILE



Orthorhombic



6½–7



3.3–4.3



Imperfect



Conchoidal



White



Vitreous

rounded,
transparent
olivine crystal

secondary
clay minerals



Peridot crystal

This gem-quality specimen of olivine, or peridot, is from Pakistan. Other important sources include China and Myanmar.

Kimyasal Formülü

$(\text{Mg, Fe})_2\text{SiO}_4$



Peridot gemstone

Green peridot, such as the one in this brooch, was used by Egyptians since the second millennium BCE.

Bonewitz, R. L. (2012)

ZİRKON

PROFILE



Tetragonal



7½



4.6–4.7



Imperfect



Uneven to
conchoidal



White



Adamantine
to oily

twinned zircon
crystal

Kimyasal Formülü

$ZrSiO_4$

VARIANTS



Purple zircon Crystals of zircon in a rock matrix



Crystalline cluster Zircon crystals that are embedded in pegmatite



Zircon bracelet

Gem zircons, such as the colorless, faceted zircons in this bracelet, have been mined for over 2,000 years.

feldspar-and-biotite
matrix

biotite

Afghan zircon

This specimen of zircon crystals in a feldspar-and-biotite matrix is from Afghanistan. The crystals are up to 1½ in (3 cm) long.

Bonewitz, R. L. (2012)

TOPAZ

PROFILE



Orthorhombic



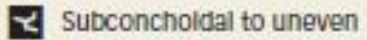
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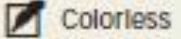
3.4-3.6



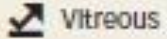
Perfect basal



Subconchoidal to uneven



Colorless



Vitreous

prismatic crystal

albite

termination face

Topaz crystal

This prismatic, pinkish brown topaz from Afghanistan is over 3 1/4 in (8 cm) tall and weighs more than 1 lb (0.5 kg).

Kimyasal Formülü

$\text{Al}_2\text{SiO}_4(\text{F}, \text{OH})_2$

VARIANTS

vitreous luster



Brown topaz

A fine, natural crystal of brown topaz

line of cleavage



Light blue topaz

A specimen of blue topaz

Imperial topaz

A golden Imperial topaz from a deposit in Brazil



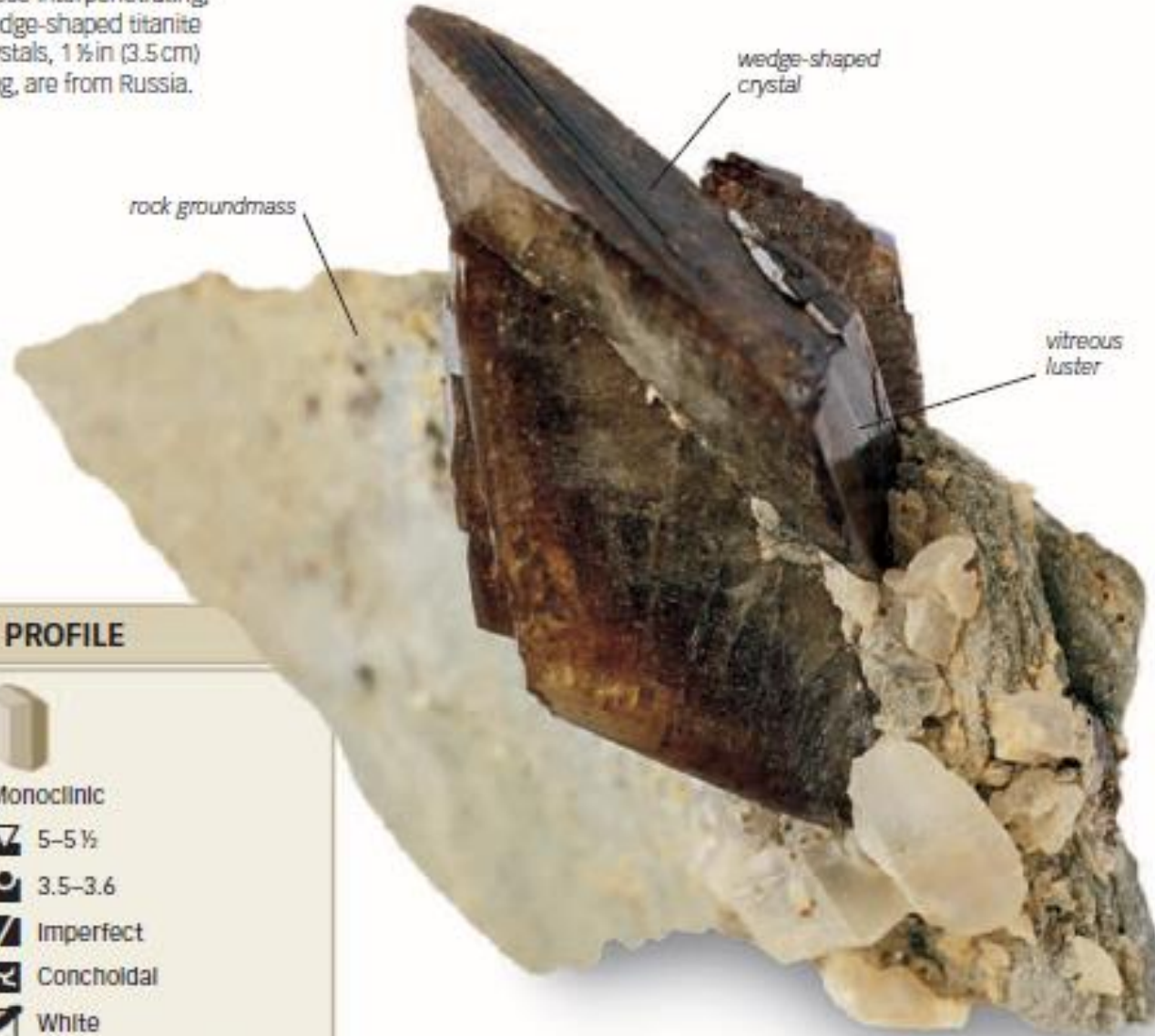
Pink topaz

A clear, octagonal step cut, pink topaz is set here in a gold ring. Natural pink topaz is rare.

TİTANİT

Titanite crystals

These interpenetrating, wedge-shaped titanite crystals, 1 ½ in (3.5 cm) long, are from Russia.



PROFILE



Monoclinic



5-5 ½



3.5-3.6



Imperfect



Conchoidal



White



Vitreous to greasy

Kimyasal Formülü

CaTiSiO_5



Titanite ring

Faceted titanites, such as the brilliant cut set in this gold ring, have superb fire and intense colors.

Bonewitz, R. L. (2012)

ANDALUZİT

PROFILE



Orthorhombic

6½–7½

3.2

Good to perfect, poor

Conchoidal

White

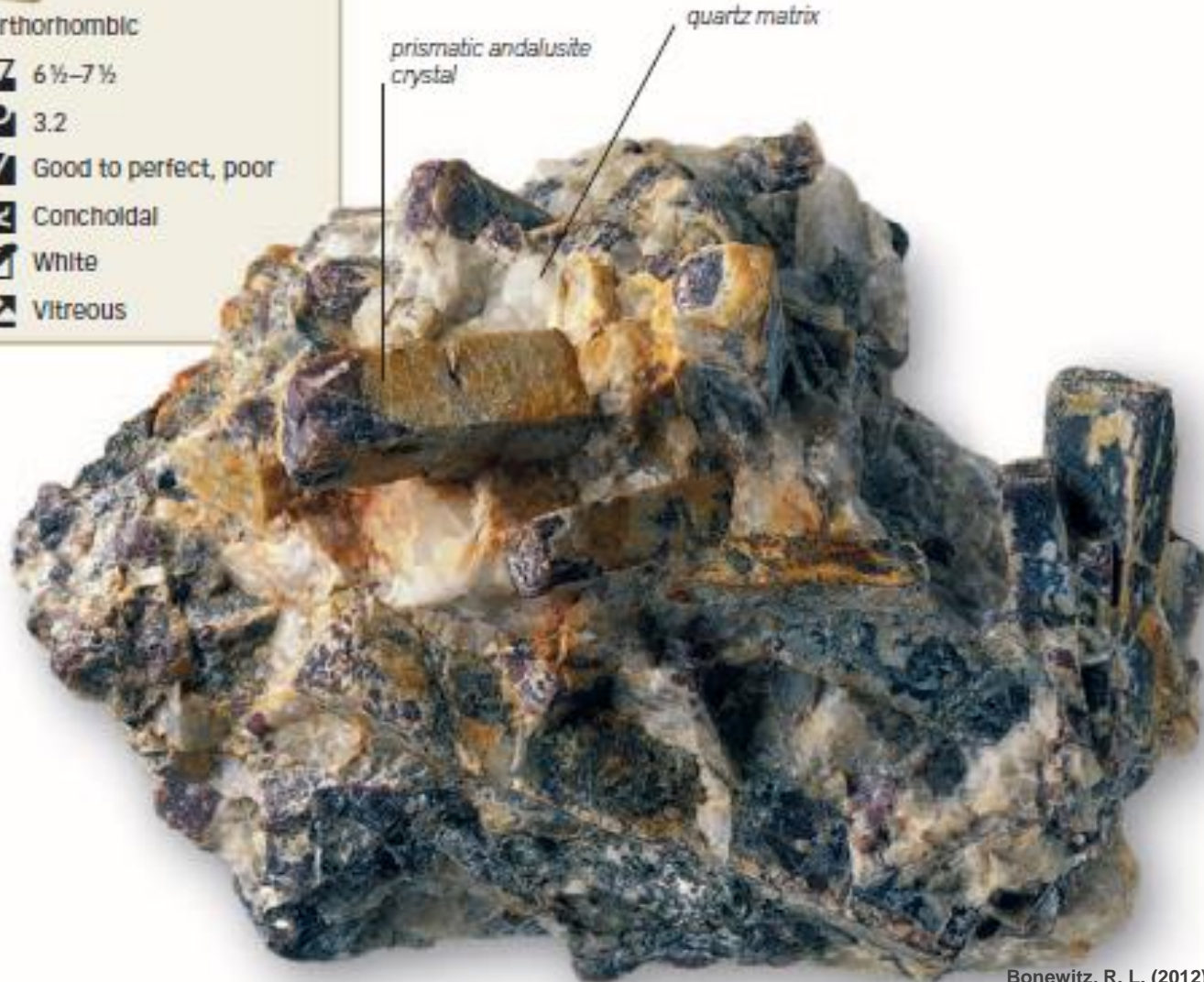
Vitreous

Andalusite crystals

This group of prismatic andalusite crystals from the Austrian Tyrol is in a matrix of quartz.

Kimyasal Formülü

Al_2OSiO_5



Rectangular step cut

Relatively uncommon, transparent andalusite is too brittle to be worn. It is faceted for gem collectors.

Bonewitz, R. L. (2012)

SİLİMANİT

PROFILE



Orthorhombic



7



3.2–3.3



Perfect



Uneven



White



Silky

vitreous luster

elongated, prismatic
sillimanite crystal

rock matrix

Prismatic sillimanite

In this specimen, elongated, prismatic crystals of sillimanite can be seen in a rock matrix.

Kimyasal Formülü

Al_2OSiO_5



Collectors' gem

Facet-grade sillimanite, such as this specimen, occurs in the gem gravels of Sri Lanka and Myanmar, and in Brazil.

STAVROLİT

PROFILE



Monoclinic

7-7½

3.7

Distinct

Conchoidal

Colorless to gray

Vitreous to resinous

prismatic
staurolite crystal

twinned
staurolite
crystals

vitreous luster

Staurolite crystals

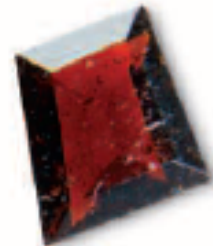
This is a specimen of staurolite in a mica schist matrix. Single and twinned crystals can be seen here.

Bonewitz, R. L. (2012)

mica schist
matrix

Kimyasal Formülü

$(\text{FeMg})_4\text{Al}_{17}(\text{SiAl})_8\text{O}_{45}(\text{OH})_3$



Trapeze-cut staurolite

Transparent staurolite, as in this stone, is a rare faceting material because of its dark color and lack of brilliance.

ÖKLAZ

PROFILE



Monoclinic

7%

3.0

Perfect

Conchoidal, brittle

White

Vitreous

prismatic euclase
crystal

rock matrix

striated crystal

Kimyasal Formülü

$\text{BeAlSiO}_4(\text{OH})$

Blue euclase

This mass of well-developed, prismatic crystals of blue euclase is on a rocky matrix.

Bonewitz, R. L. (2012)



Euclase gemstone

This square-cut euclase gemstone shows small, dark inclusions of another mineral.

GRANAT

PROFILE



Cubic

7-7½

3.6

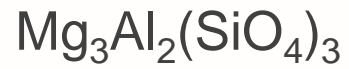
None

Conchoidal, brittle

White

Vitreous

Kimyasal
Formülü



Pyrope gemstones

Beautiful garnet jewelry comes from Bohemia, Czech Republic, where pyropes as big as hens' eggs are found.

rock matrix

pyrope crystal

conchoidal fracture

Pyrope in matrix

This specimen from Mexico includes several pyrope garnets in a matrix. Most pyrope is found as pebbles in placer deposits with other gems.

Bonewitz, R. L. (2012)

PROFILE



Cubic

7-7½

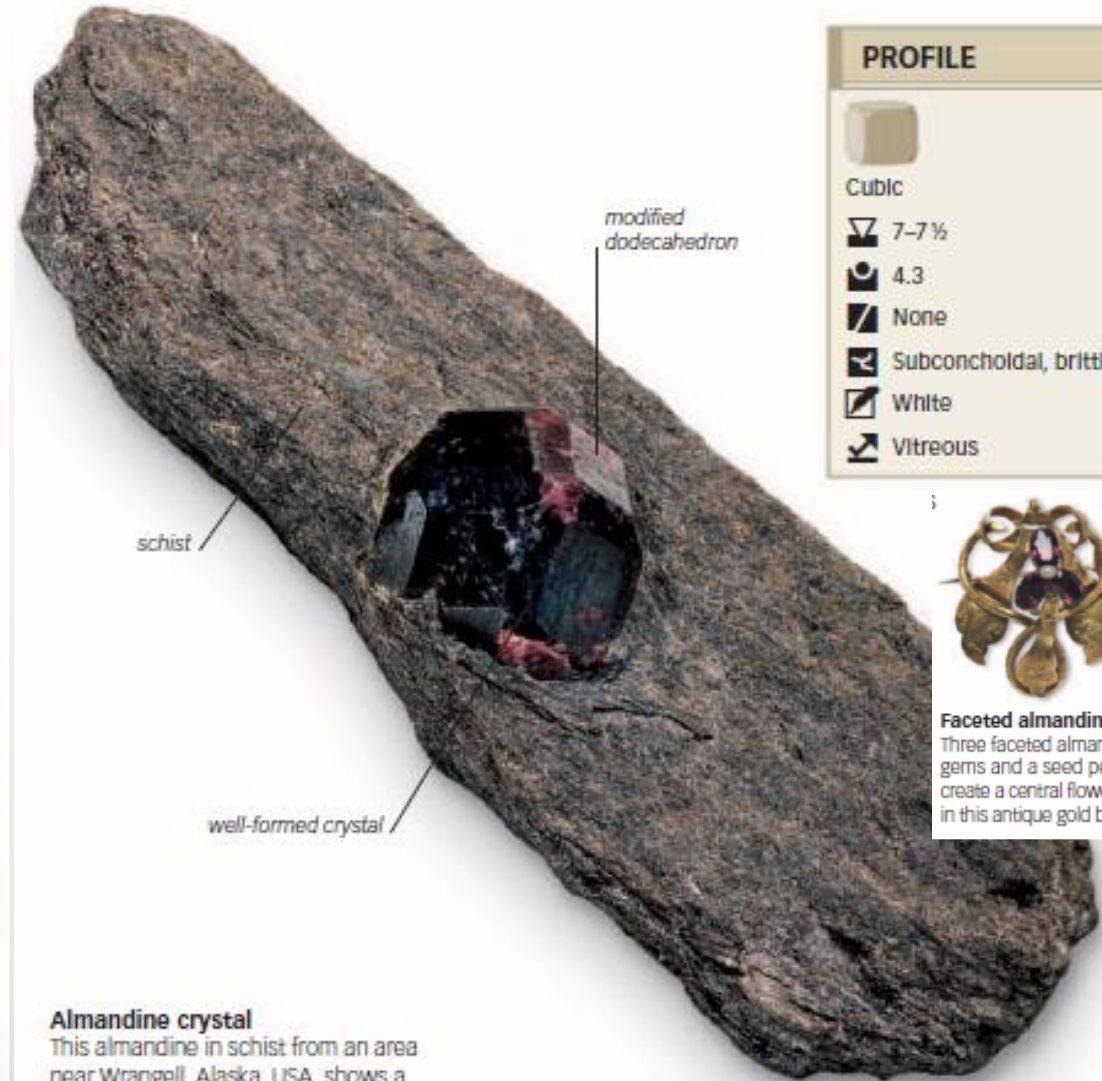
4.3

None

Subconchoidal, brittle

White

Vitreous



schist

modified
dodecahedron

well-formed crystal

Almandine crystal

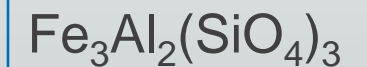
This almandine in schist from an area near Wrangell, Alaska, USA, shows a modified dodecahedral form.



Faceted almandine

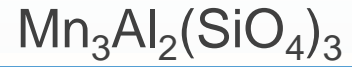
Three faceted almandine gems and a seed pearl create a central flower motif in this antique gold brooch.

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GRANAT

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Spessartine crystals

In this specimen from Norway, well-formed dodecahedral crystals encrust a rock matrix.

PROFILE



Cubic

▽ 7-7 1/2

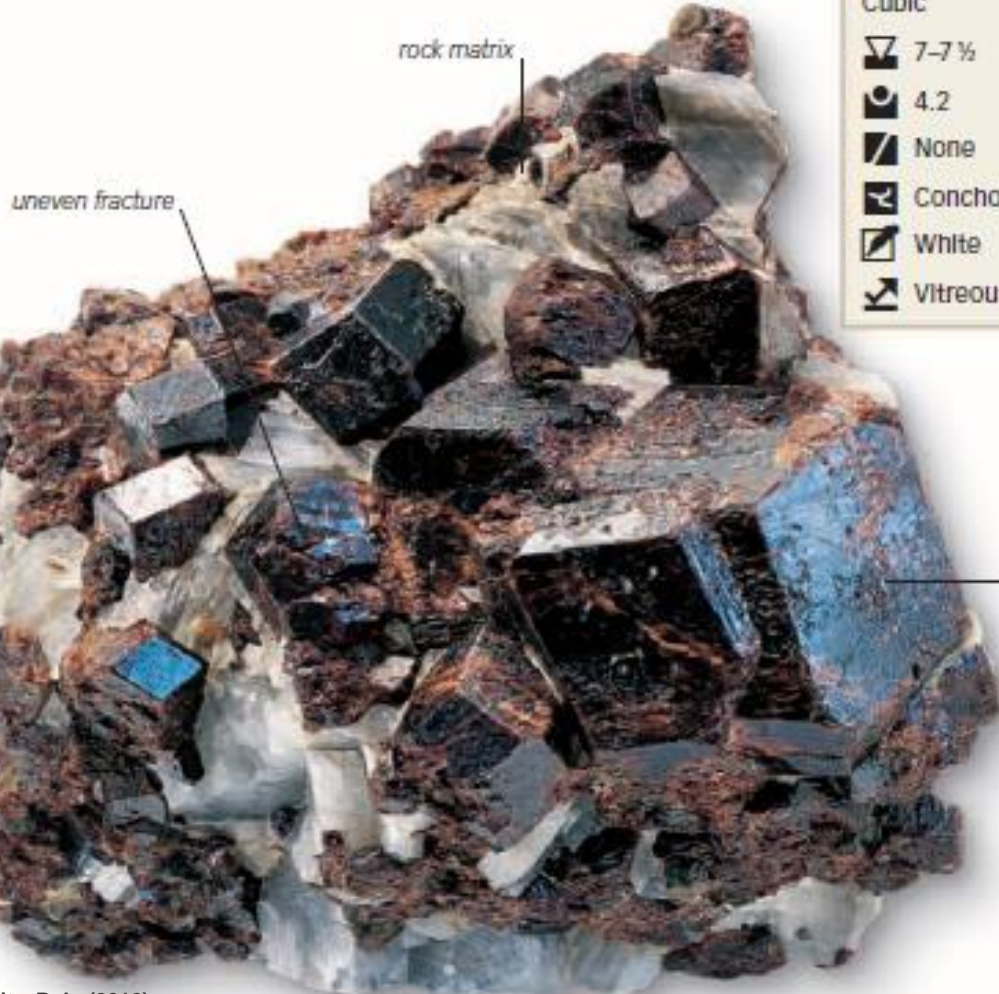
☉ 4.2

▣ None

☒ Conchoidal, brittle

▣ White

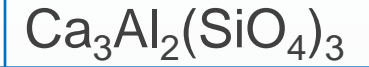
▣ Vitreous



Octagonal step cut

Because of spessartine's rich color, the liquid inclusions under the edge facets in this gem are not very noticeable.

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PROFILE



Cubic

▽ 6 1/2-7

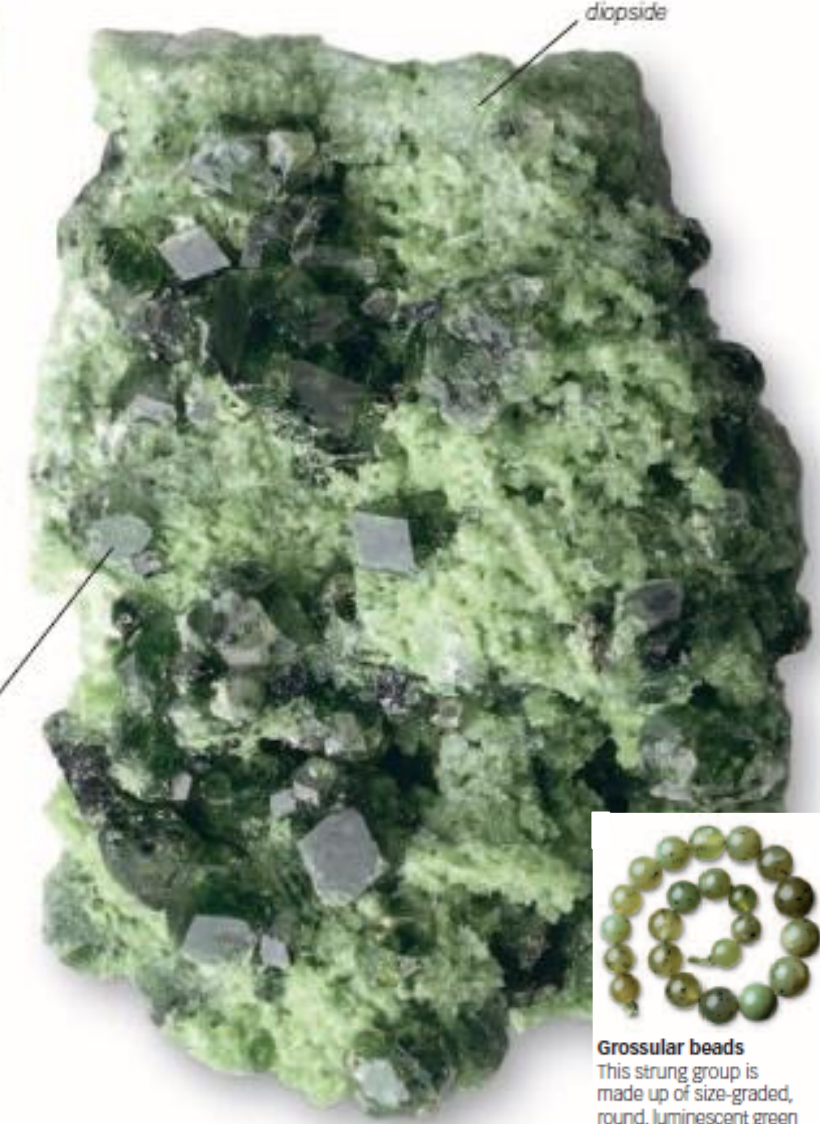
☉ 3.6

▣ None

☒ Conchoidal

▣ White

▣ Vitreous



Grossular on diopside

These grossular crystals from Piedmont, Italy, are set on a matrix of diopside.

Grossular beads

This strung group is made up of size-graded, round, luminescent green grossular beads.

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