



T.C.
Ankara Üniversitesi
Mühendislik Fakültesi
Jeoloji Mühendisliği Bölümü



JEM 361

ÖZEL MİNERALOJİ

Dr. Öğr. Üyesi Kıymet DENİZ

4. Hafta

2020-2021 Güz Dönemi

Bu ders notlarının hazırlanmasında Mefail Yenyol'un sunumlarından, Mineraloji kitabından ve Bonewitz, R. L. (2012)'nin Nature Guide Rocks and Minerals adlı kitanından yararlanılmıştır.

SPINEL

Kimyasal Formülü



PROFILE



Cubic

7½–8

3.6–4.1

None

Conchoidal
to uneven

White

Vitreous

Spinel octahedrons

In this specimen, octahedral crystals of pleonaste, or black spinel, are set in a quartz matrix.

octahedral spinel
crystal



quartz matrix



Spinel gemstone

This superb faceted spinel shows excellent red-lavender color and good clarity.

Bonewitz, R. L. (2012)

DIYASPOR

Kimyasal Formülü

AlO(OH)

PROFILE



Orthorhombic

 $6\frac{1}{2}$ -7

 3.4

 Perfect, Imperfect

 Conchoidal, brittle

 White

 Vitreous



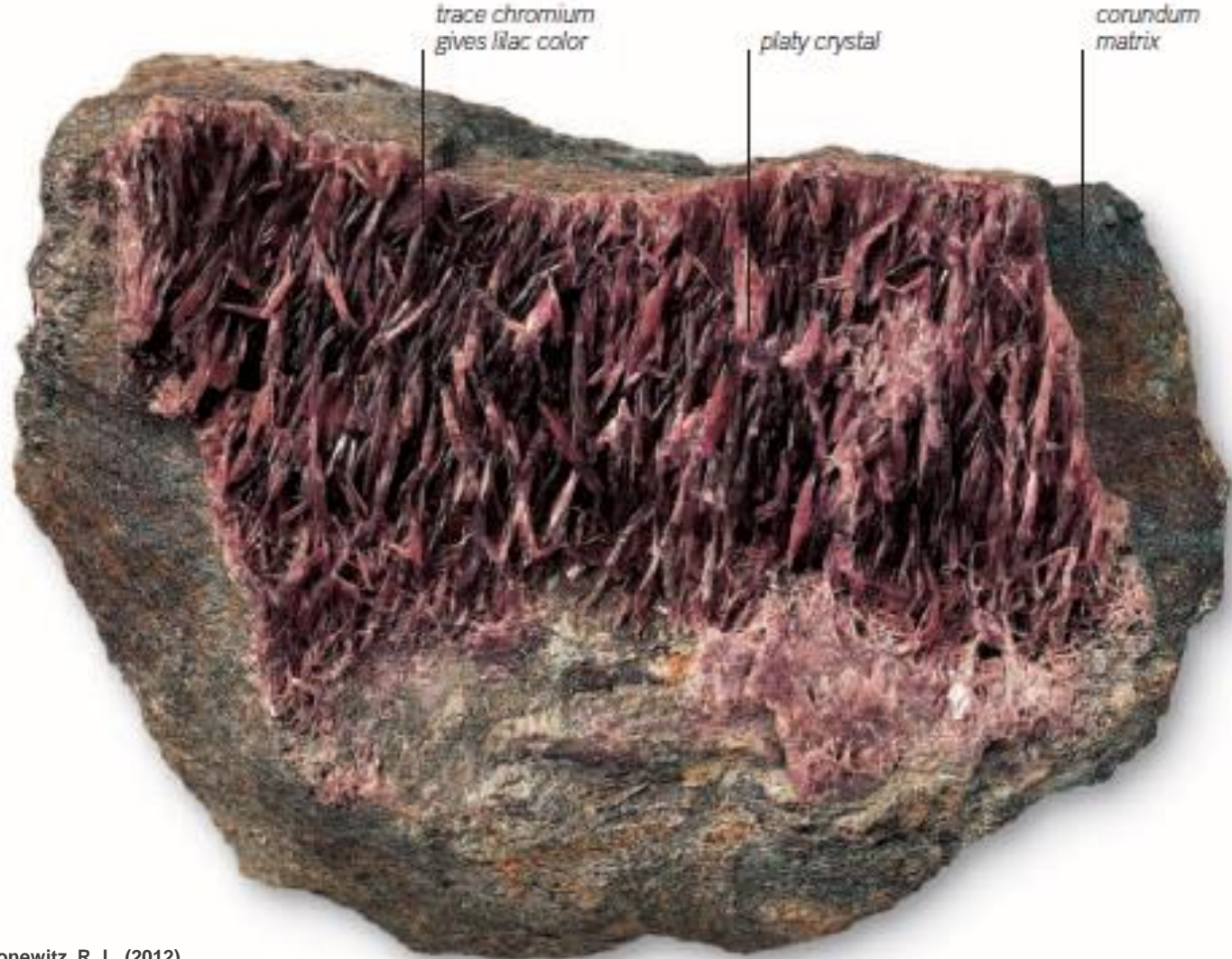
Faceted gem

Zultanite, which is a rare, transparent type of diaspore crystal from Turkey, is a collector's gem.



Dark red diaspore

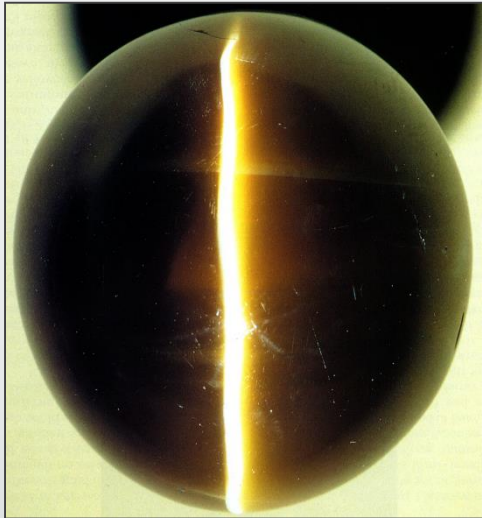
In this specimen, a mass of dark red, thin, platy diaspore crystals rests in a matrix of corundum.



Bonowitz, R. L. (2012)

KRİZOBERİL

Kimyasal Formülü



Yellow gemstone Cat's eye chrysoberyl in the most desirable honey-yellow color



Color change Alexandrite exhibits color change—from brilliant green in daylight to cherry-red under tungsten light.

PROFILE

Orthorhombic

8 1/2

3.7

Distinct

Uneven to conchoidal

Colorless

Vitreous

striation on crystal face

Cyclic twin

The cyclic twinning of chrysoberyl exhibited by this specimen is common in the mineral.

greenish yellow twinned crystal

transparent with vitreous luster

pseudo-hexagonal twinned crystal

Bonowitz, R. L. (2012)

SFALERİT

Kimyasal Formülü ZnS

PROFILE



Cubic



3 ½-4



3.9-4.1



Perfect in six directions



Conchoidal



Brownish to light yellow



Resinous to adamantine, metallic

Sphalerite crystals

These superbly formed sphalerite crystals occur with well-crystallized pyrite and quartz. They are from Casapalca, Lima, Peru.



Oval cut

This oval cut shows off the golden brown color of sphalerite. Such stones are cut for collectors.



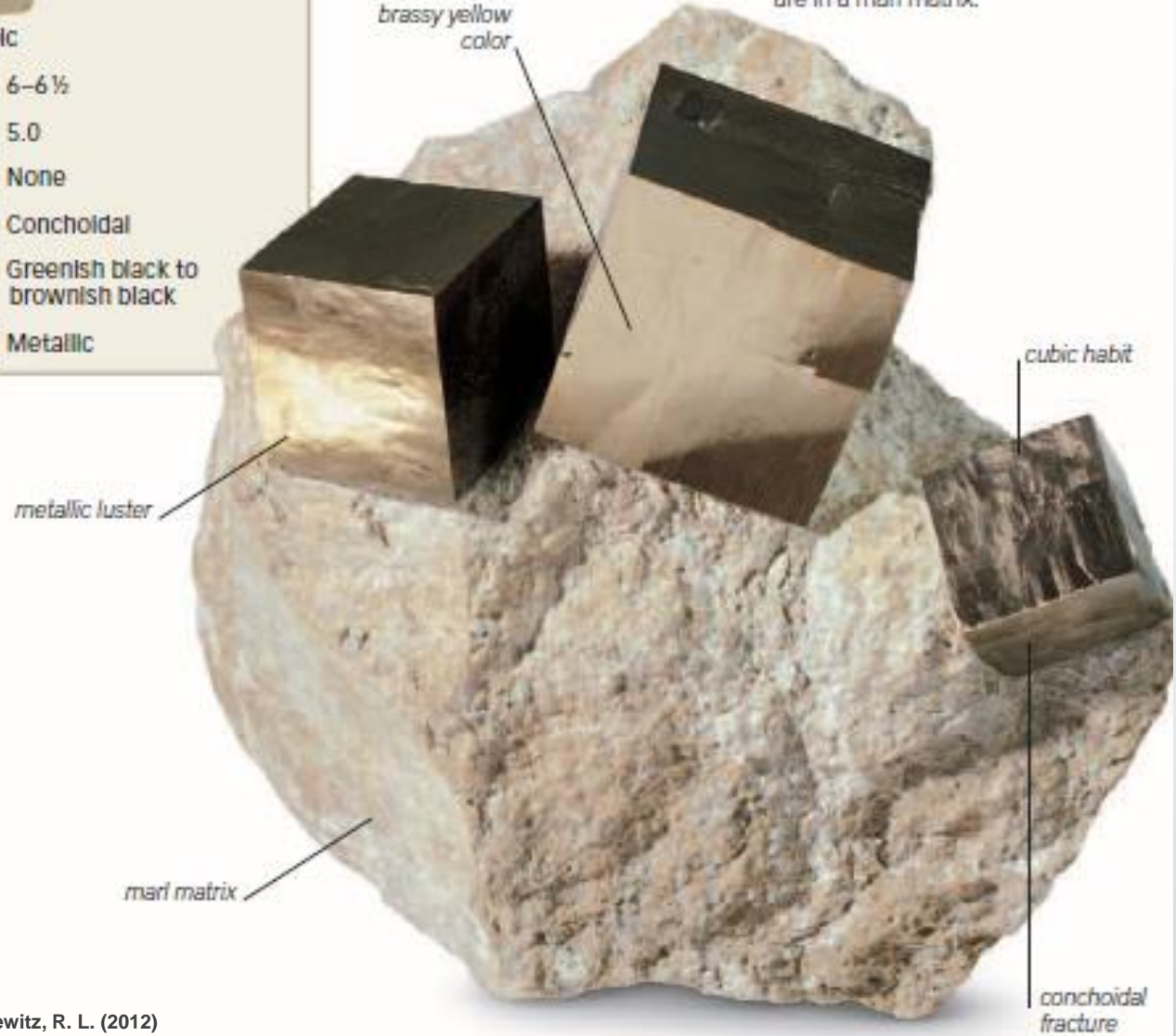
Bonewitz, R. L. (2012)

PIRİT

Kimyasal Formülü FeS_2

PROFILE	
	Cubic
	6-6½
	5.0
	None
	Conchoidal
	Greenish black to brownish black
	Metallic

Cubic pyrite
These three perfectly formed pyrite crystals—up to 1 ½ in (3.5 cm) wide—from Navajún, La Rioja, Spain, are in a marl matrix.



Pyrite beads
With care, brittle pyrite can be ground into beads, such as those strung together in this necklace.

Bonewitz, R. L. (2012)

MARKASİT

Kimyasal Formülü FeS_2

PROFILE



Orthorhombic

6-6½

4.9

Distinct

Uneven or Irregular

Gray to black

Metallic



Art Deco jewelry

Marcasite was a popular choice for Victorian and Art Deco jewelry, although most of the material used was actually pyrite.

Bonewitz, R. L. (2012)

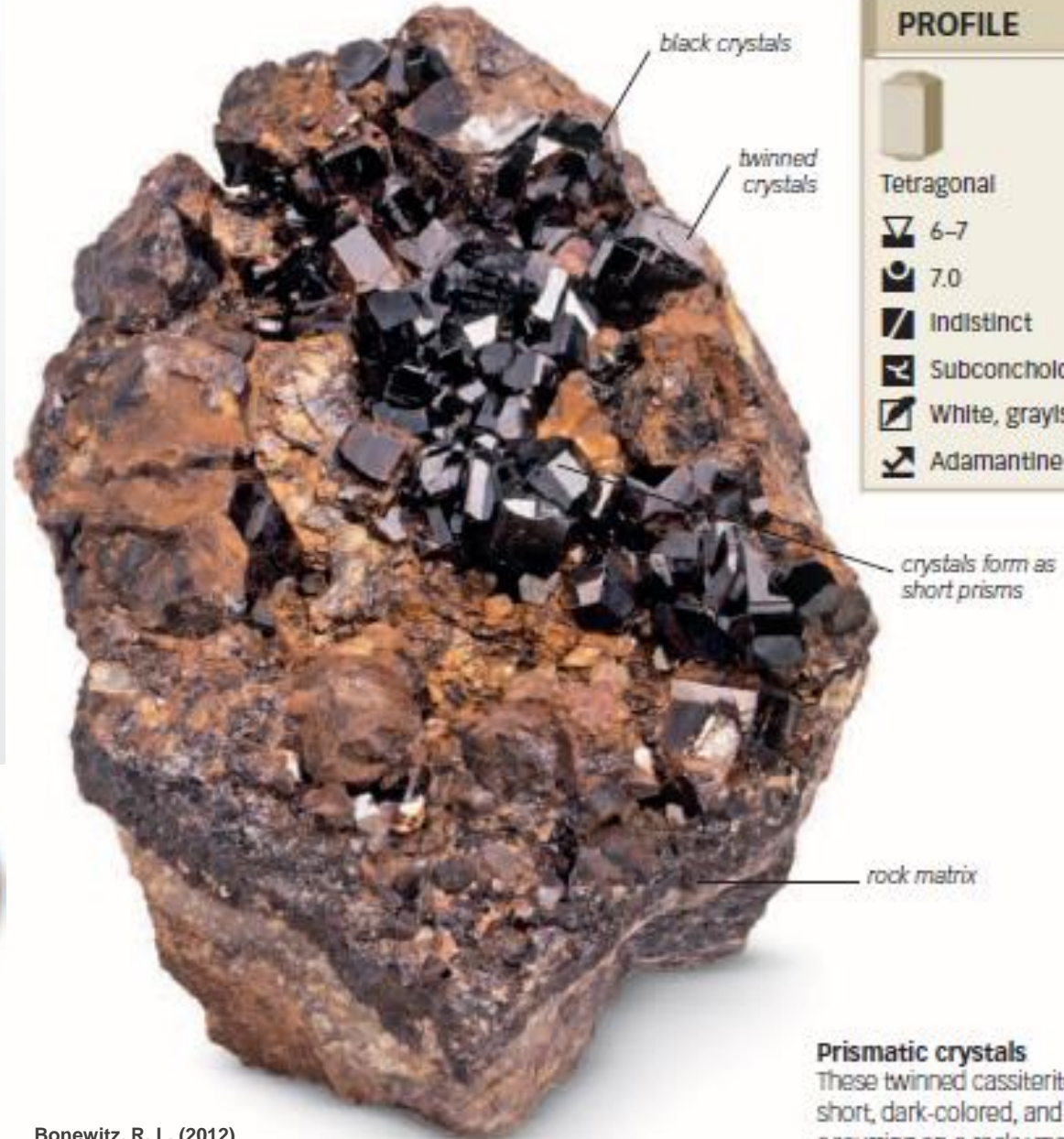


Marcasite crystals

This striking group of marcasite crystals is on a matrix of chalk. It formed in Cap Blanc-Nez, Pas-de Calais, France.

KASİTERİT

Kimyasal Formülü



PROFILE



Tetragonal

6-7

7.0

Indistinct

Subconchoidal to uneven

White, grayish, brownish

Adamantine to metallic



Brilliant gemstone

This faceted, golden orange cassiterite gem is transparent with a resinous luster.

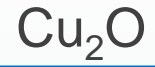
Bonewitz, R. L. (2012)

Prismatic crystals

These twinned cassiterite crystals are short, dark-colored, and prismatic, occurring on a rocky matrix.

KUPRİT

Kimyasal Formülü



PROFILE



Cubic



3½–4



6.1



Distinct



Conchoidal, brittle



Brownish red, shining



Adamantine, submetallic



Step cut

Rare transparent cuprite is sometimes cut for collectors, as in this rectangular step cut.

Red cuprite

Cuprite crystals are octahedral, cubic, or rarely dodecahedral. They come from Bisbee and other regions in Arizona, USA.

Bonowitz, R. L. (2012)

translucent red

KUPRİT

Rhombohedral hematite

These superb hematite crystals from Elba, Italy, demonstrate hexagonal or rhombohedral form and metallic luster.



Kimyasal Formülü



PROFILE



Hexagonal



5-6



5.3



None



Subconchoidal to uneven



Cherry-red or red-brown



Metallic to dull



Oval cabochon

This oval cabochon of black hematite is faceted on top. Hematite cabochons have been sold as "marcasites."

Bonewitz, R. L. (2012)

SERUZİT

Kimyasal Formülü

$PbCO_3$

Tabular crystals
In this specimen, a mass of tabular cerussite crystals covers a rock matrix.

adamantine luster

tabular crystal


twinned crystal





PROFILE




Orthorhombic


 3-3½

 6.5

 Distinct

 Conchoidal,
brittle

 Colorless

 Adamantine
to vitreous



Collector's gem

Faceted cerussite stones, such as this rare gem, are brilliant but too soft to be worn.

Bonewitz, R. L. (2012)

AZURİT

PROFILE



Monoclinic

3½–4

3.8

Perfect

Conchoidal, brittle

Blue

Vitreous to dull earthy

Large crystals

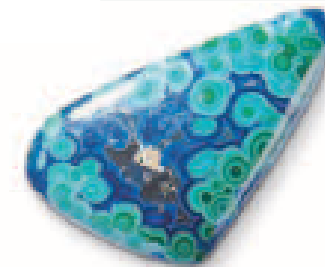
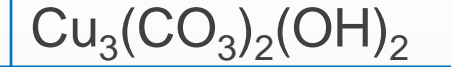
In this specimen of azurite, large, well-formed crystals rest on a goethite matrix.

vitreous luster

goethite matrix

blocky, azure-blue crystal

Kimyasal Formülü



Cabochon gemstone

This cabochon exhibits the vivid blue color of azurite and the green color of malachite.

RODOKROZİT

PROFILE



Hexagonal



3½–4



3.6



Perfect rhombohedral



Uneven



White



Vitreous to pearly

rhombohedral
crystal

cherry-red color

quartz

vitreous luster

Spectacular crystal

This group of rhodochrosite rhombohedrons from Peru is perched on radiating quartz crystals.

Bonewitz, R. L. (2012)

Kimyasal Formülü

$MnCO_3$



Rhodochrosite carvings

These two decorative ducks were carved from banded rhodochrosite and white calcite.

SİMİTSONİT

PROFILE



Hexagonal



4-4½



4.4



Perfect rhombohedral



Uneven to conchoidal



White



Vitreous to pearly

rounded mass shows
botryoidal habit

pearly luster

coating of blue
smithsonite

green smithsonite

Kimyasal Formülü

$ZnCO_3$

Blue and green smithsonite

This translucent mass
of botryoidal smithsonite
rests on a rock matrix.

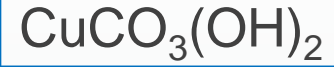


Cabochon

Soft smithsonite is
occasionally cut into
cabochon gemstones
for collectors.

MALAKİT

Kimyasal Formülü



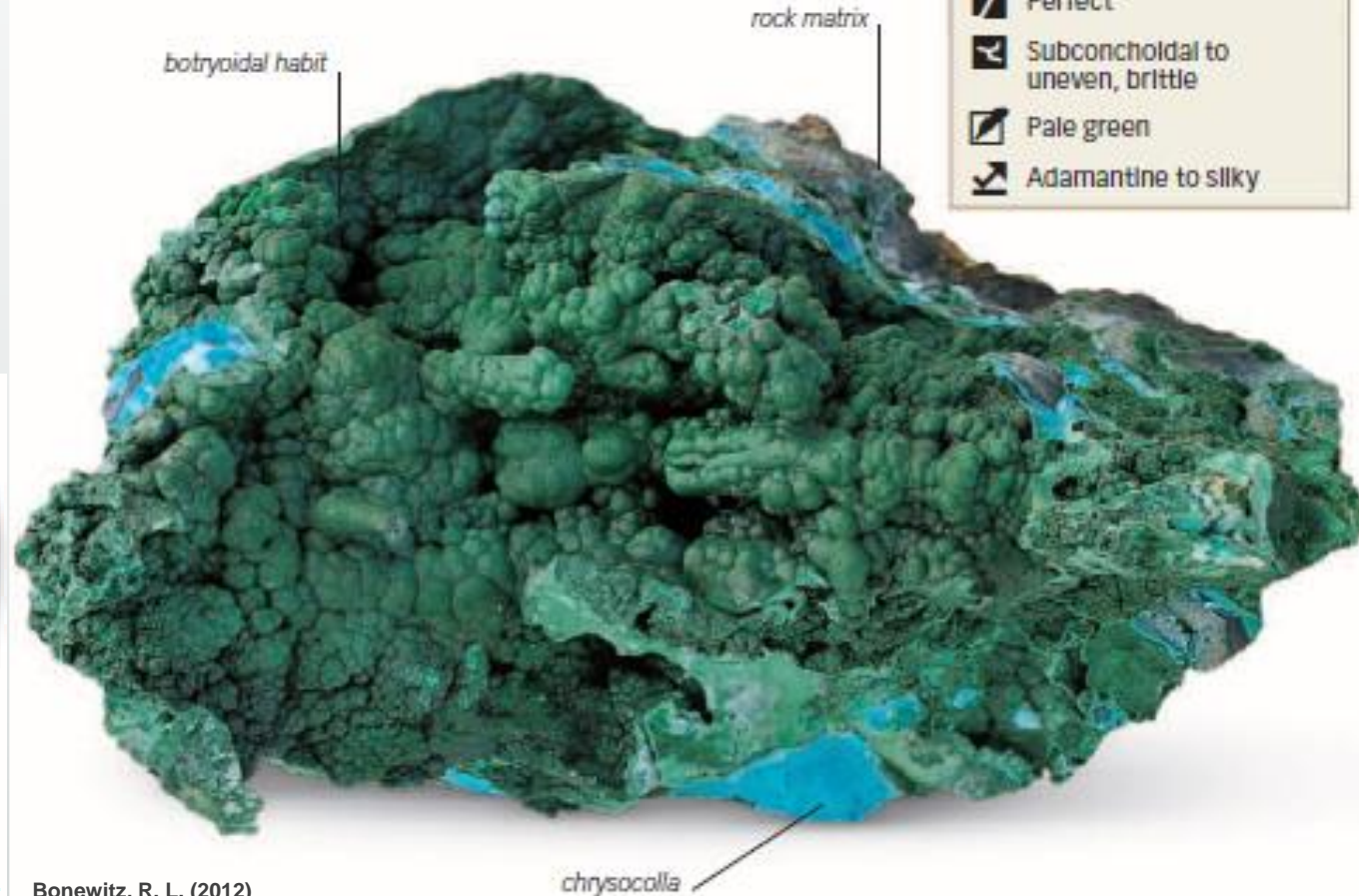
Botryoidal malachite

This specimen of malachite on chrysocolla is from Etoile du Congo Mine in Katanga province, Congo.



Polished malachite

This specimen of the mineral malachite has been polished to show dark and light color bands.



PROFILE



Monoclinic

3½–4

3.9–4.0

Perfect

Subconchoidal to uneven, brittle

Pale green

Adamantine to silky

Bonewitz, R. L. (2012)

HOVLİT

Kimyasal Formülü



PROFILE



Monoclinic

3%

2.6

None

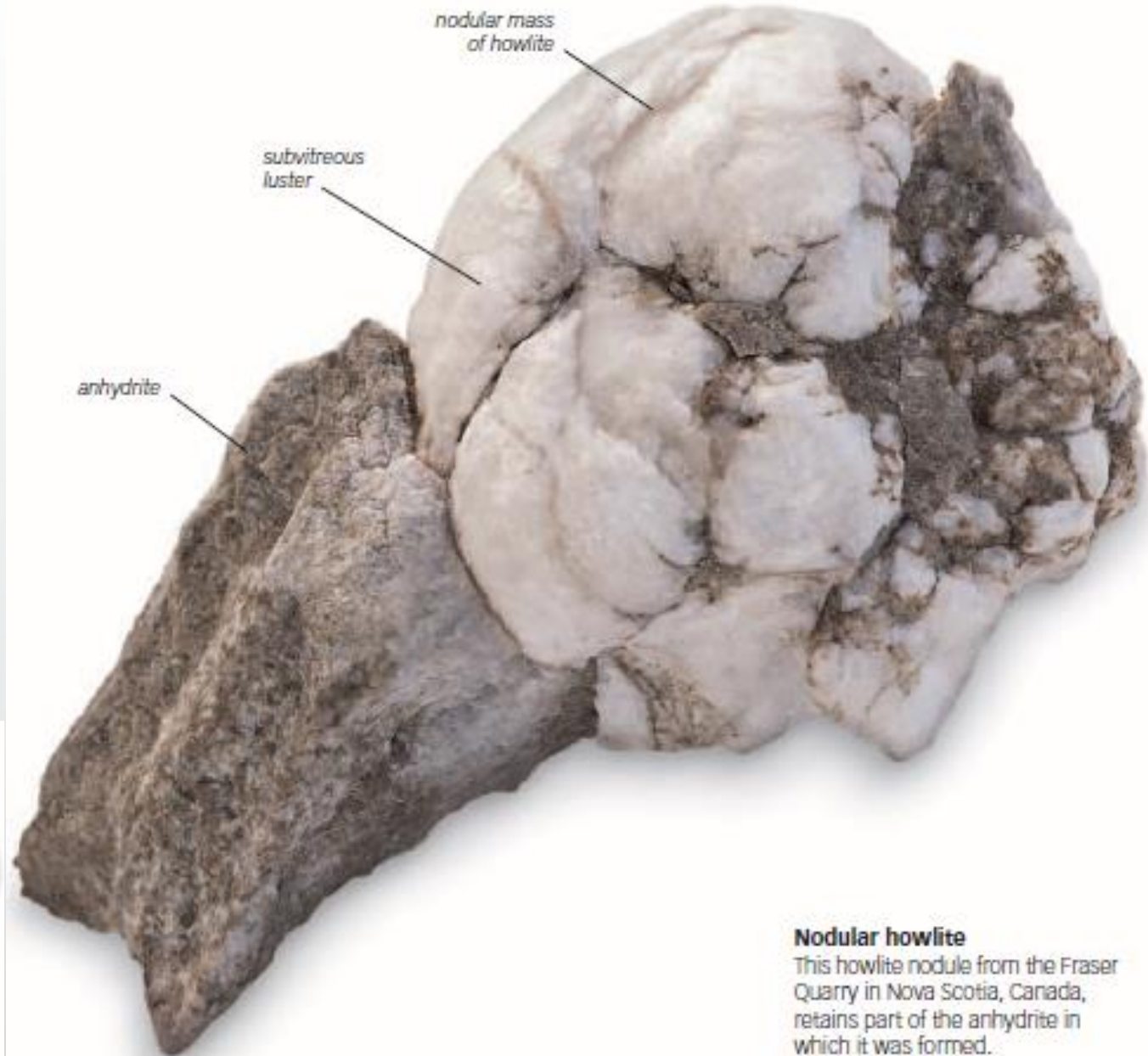
Conchoidal to uneven

White

Subvitreous



Stained howlite
This tumble-polished and dyed or stained piece of howlite looks similar to turquoise.



Bonewitz, R. L. (2012)

Nodular howlite
This howlite nodule from the Fraser Quarry in Nova Scotia, Canada, retains part of the anhydrite in which it was formed.

ANGLEZİT

PROFILE



Orthorhombic

2½–3

6.4

Good, distinct

Conchoidal, brittle

Colorless

Adamantine to resinous,
vitreous

Anglesite crystals

These striated prismatic crystals of anglesite are on a rock matrix with galena.

Kimyasal Formülü

PbSO_4

prismatic crystal

rock matrix



galena



Oval-cut anglesite

Anglesite is soft and easily cleaved. It is one of the stones used to test the skills of master gem cutters.

BARİT

PROFILE



Orthorhombic

3-3½

4.5

Perfect

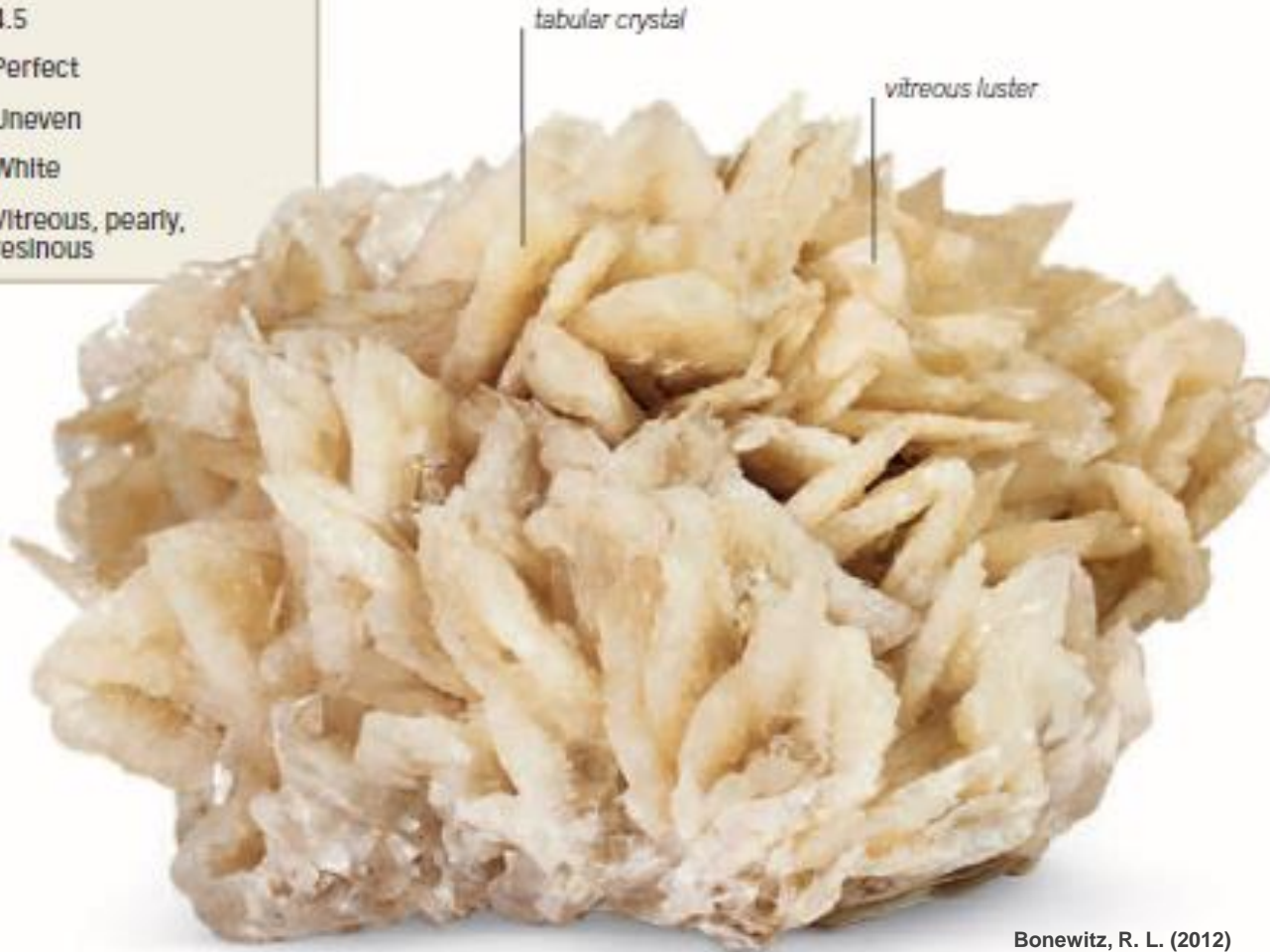
Uneven

White

Vitreous, pearly,
resinous

Barite crystals

This large group of tabular barite crystals is from the Wet Grooves Mine in Yorkshire, England.



Bonewitz, R. L. (2012)

Kimyasal Formülü

$BaSO_4$



Barite gemstone

Although transparent barite is soft and difficult to cut, it is sometimes faceted for collectors.

SELESTİN

PROFILE



Orthorhombic

3-3½

4.0

Perfect

Uneven

White

Vitreous, pearly
on cleavage

Celestine crystals

This superbly crystallized specimen of blue celestine crystals is from Madagascar. The largest crystal is more than 1½ in (3.5 cm) long.



Kimyasal Formülü

SrSO_4



Collector's gem

Celestine is too soft to wear. Faceted celestine demonstrates the skills of master cutters.

Bonewitz, R. L. (2012)

PROFILE



Monoclinic



2



2.3



Perfect



Splintery



White



Subvitreous to pearly

attachment point

vertical striations

pearly luster

termination face

Kimyasal Formülü

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Selentine gypsum crystal

This single transparent, prismatic crystal of selenite comes from the Cave of Swords in Mexico.



Cat's eye sheen

Satin spar, a fibrous variety of gypsum, can be cut into a cabochon gem with a cat's eye sheen.

ŞEELİT

Bipyramidal scheelite

This group of orange-yellow scheelite crystals clearly shows a tetragonal bipyramidal habit.

magnetite matrix

bipyramidal
scheelite crystal



Kimyasal Formülü

CaWO_4

PROFILE



Tetragonal

4½–5

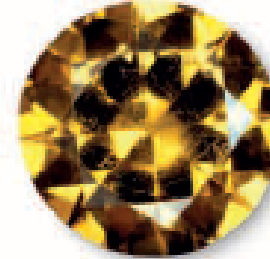
6.1

Distinct

Uneven to subconchoidal

White

Vitreous to greasy



Brilliant cut scheelite

Transparent scheelite is relatively rare. Stones faceted from it are only for gem collectors.

Bonewitz, R. L. (2012)

APATİT

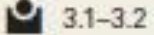
PROFILE



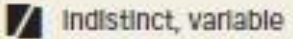
Monoclinic



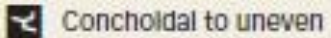
5



3.1-3.2



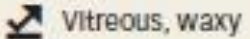
Indistinct, variable



Conchoidal to uneven



White



Vitreous, waxy

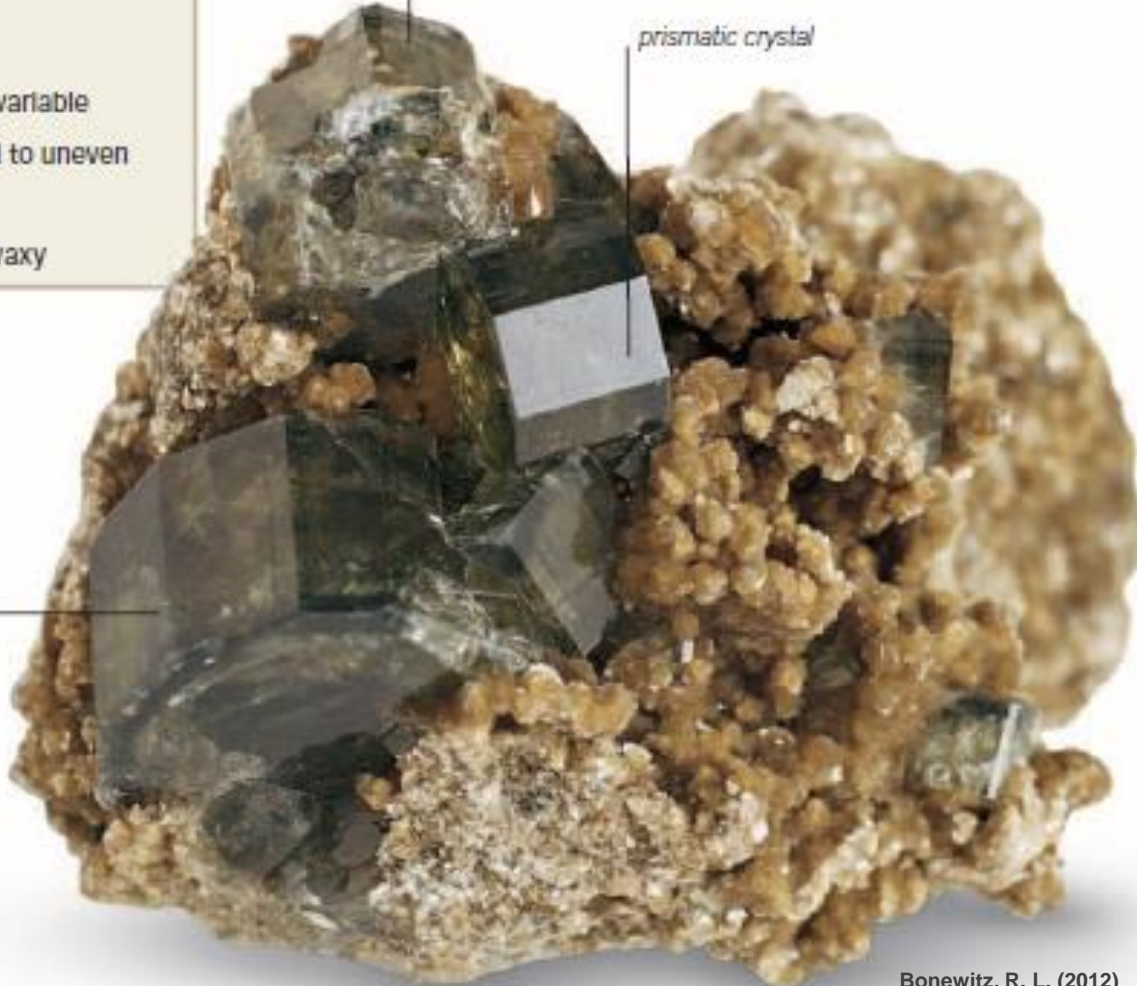
Apatite crystals

These spectacular apatite crystals from Panasqueira Mine, Beira Baixa, Portugal, occur with muscovite and a small amount of arsenopyrite.

color-zoned
crystal

prismatic
crystal

hexagonal,
transparent
crystal



Bonewitz, R. L. (2012)

Kimyasal Formülü

$\text{Ca}_5(\text{PO}_4)_3(\text{F}, \text{OH}, \text{Cl})$



Step-cut gemstone

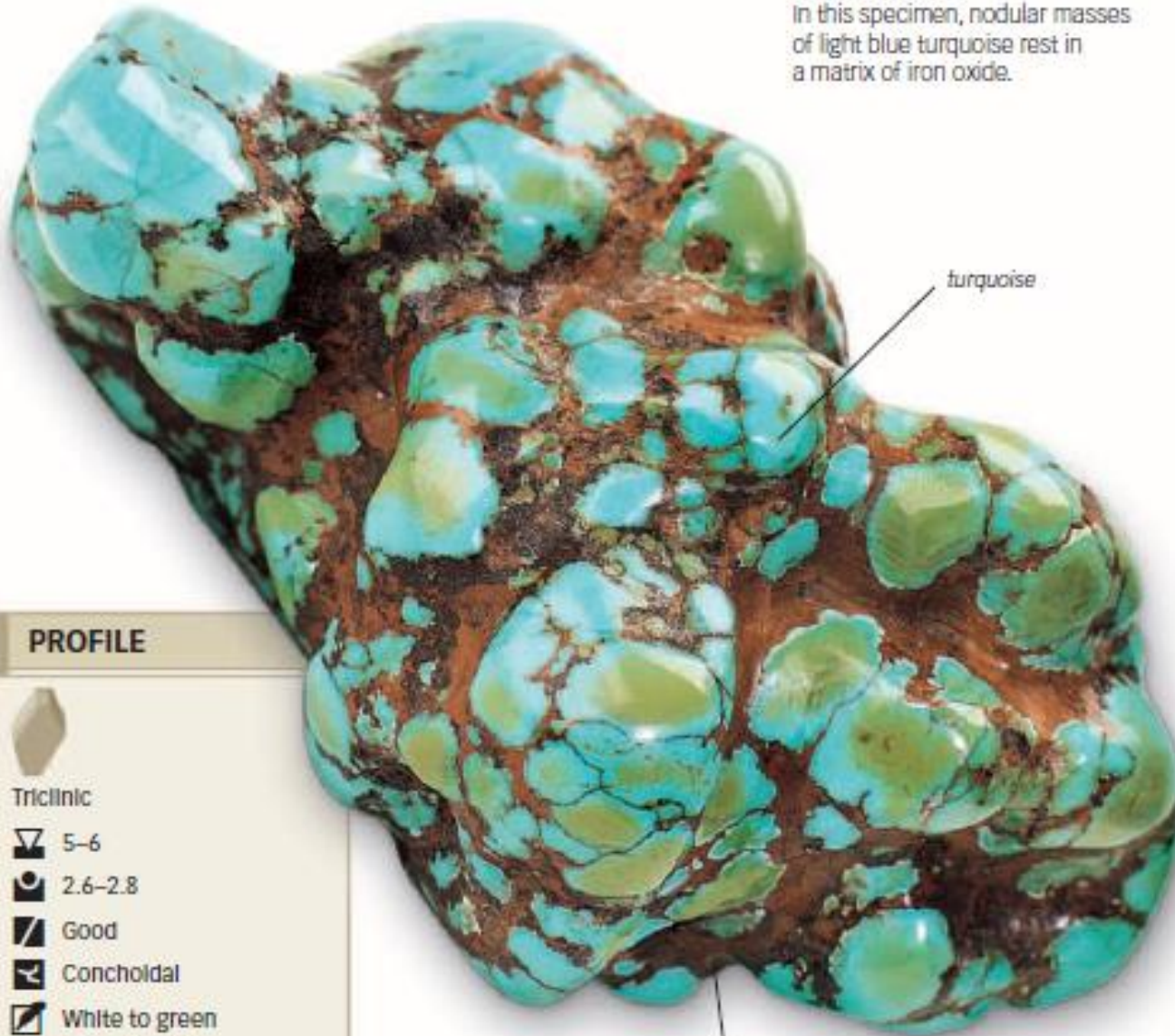
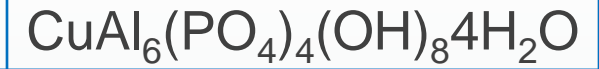
Owing to the brittleness of apatite, an edge of one facet of this blue gemstone has become chipped.

TURKUAZ

Blue turquoise

In this specimen, nodular masses of light blue turquoise rest in a matrix of iron oxide.

Kimyasal Formülü



turquoise

iron-oxide matrix

PROFILE



Triclinic

5-6

2.6-2.8

Good

Conchoidal

White to green

Waxy to dull



Carved elephant

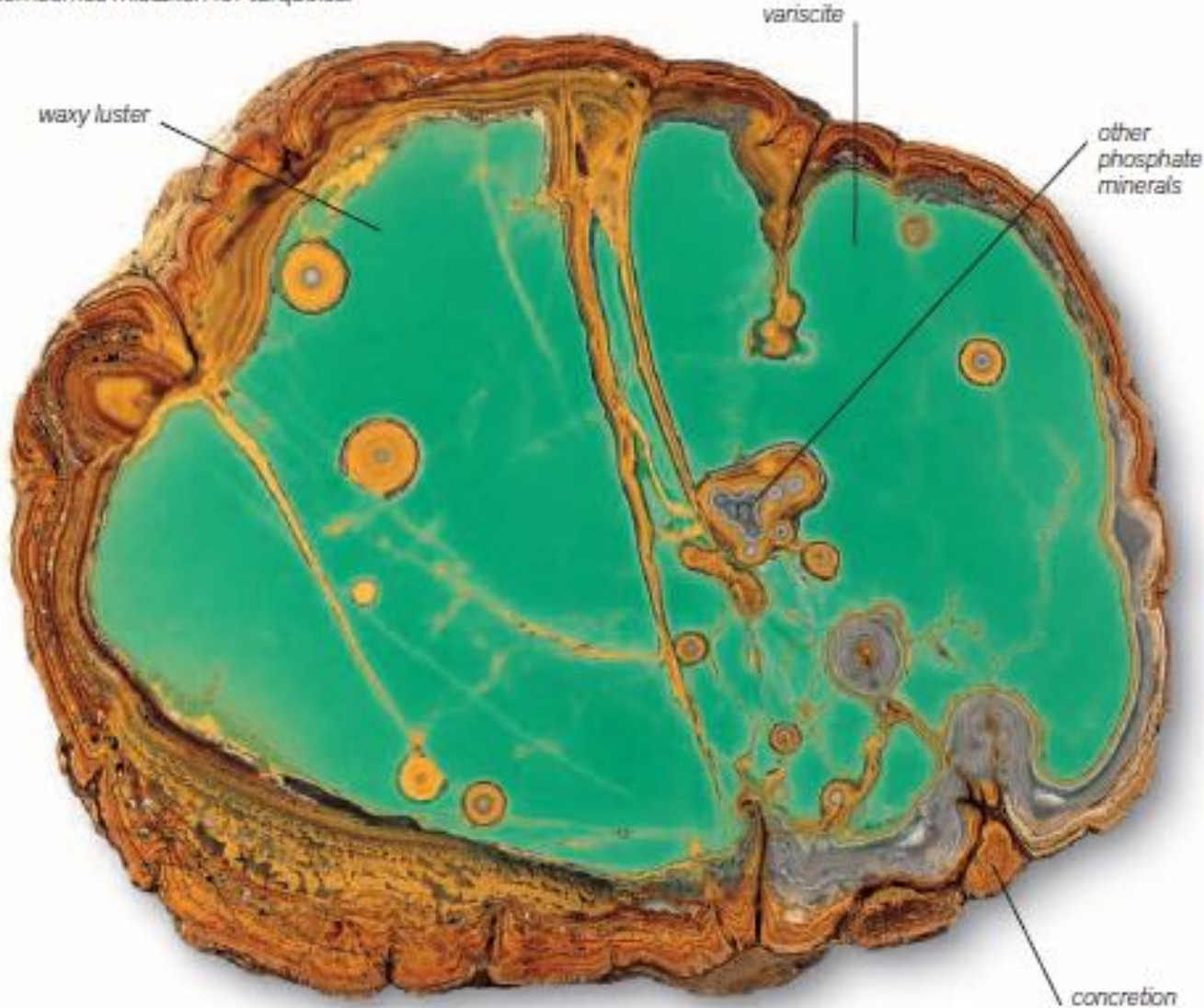
Turquoise is a favorite of Chinese stone carvers, who produced this turquoise elephant.

Bonowitz, R. L. (2012)

VARİSİT

Concretionary variscite

Variscite is often found in nodules and concretions like the sliced specimen shown here. It can be sometimes mistaken for turquoise.



Kimyasal Formülü

$\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$

PROFILE



Orthorhombic

4 1/2

2.6

Good but rarely visible

Splintery in massive

White

Vitreous to waxy



Cabochon

Variscite can be polished into inexpensive gems, but their softness makes them vulnerable to wear.

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



Chrysoprase Chalcedony
colored green by nickel

Carnelian A piece of
red-orange chalcedony

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

Brazilian agate

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

Bonewitz, R. L. (2012)

Kimyasal Formülü

SiO_2

JASPER

PROFILE



Hexagonal



7



2.7



None



Conchoidal



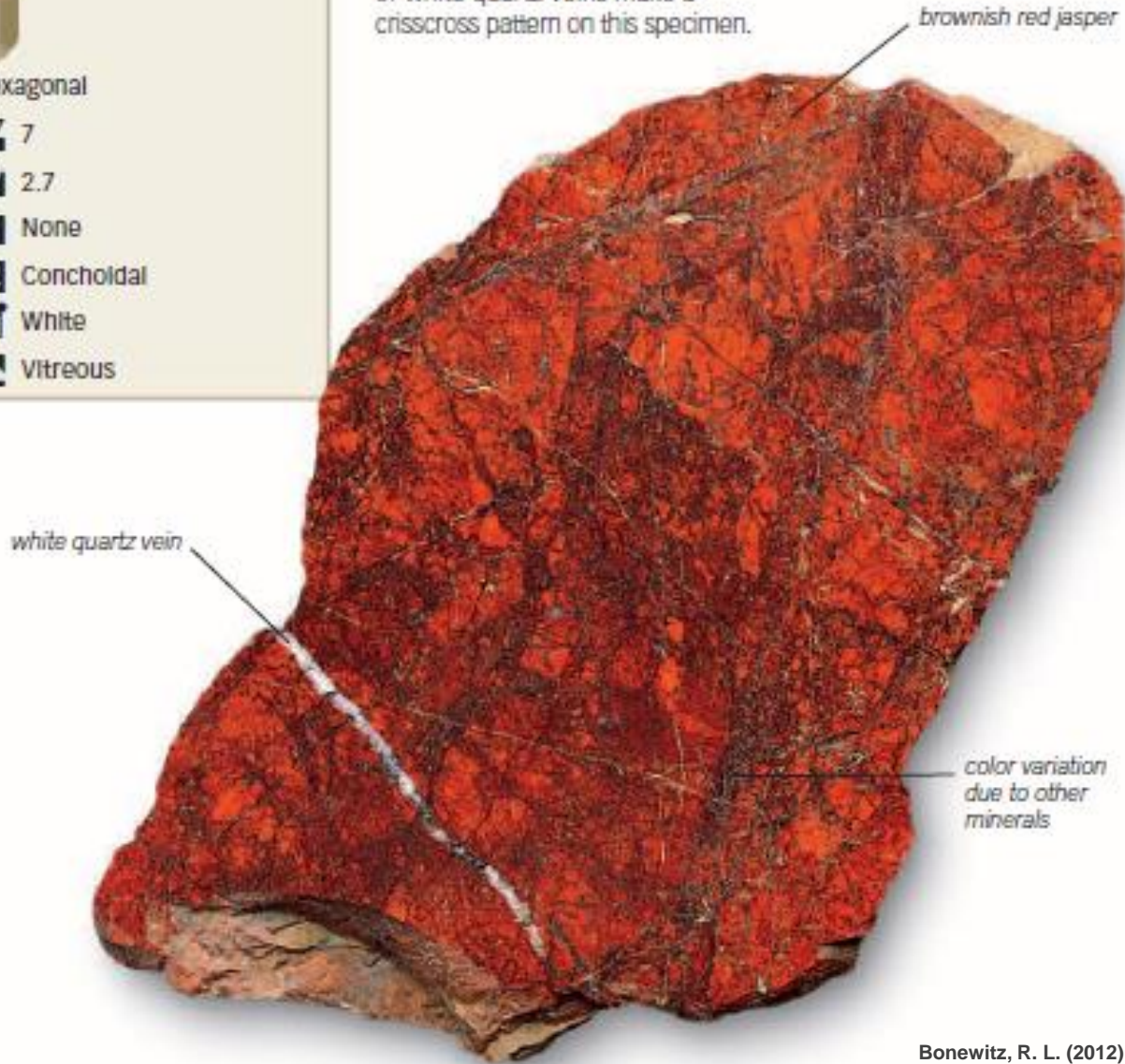
White



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

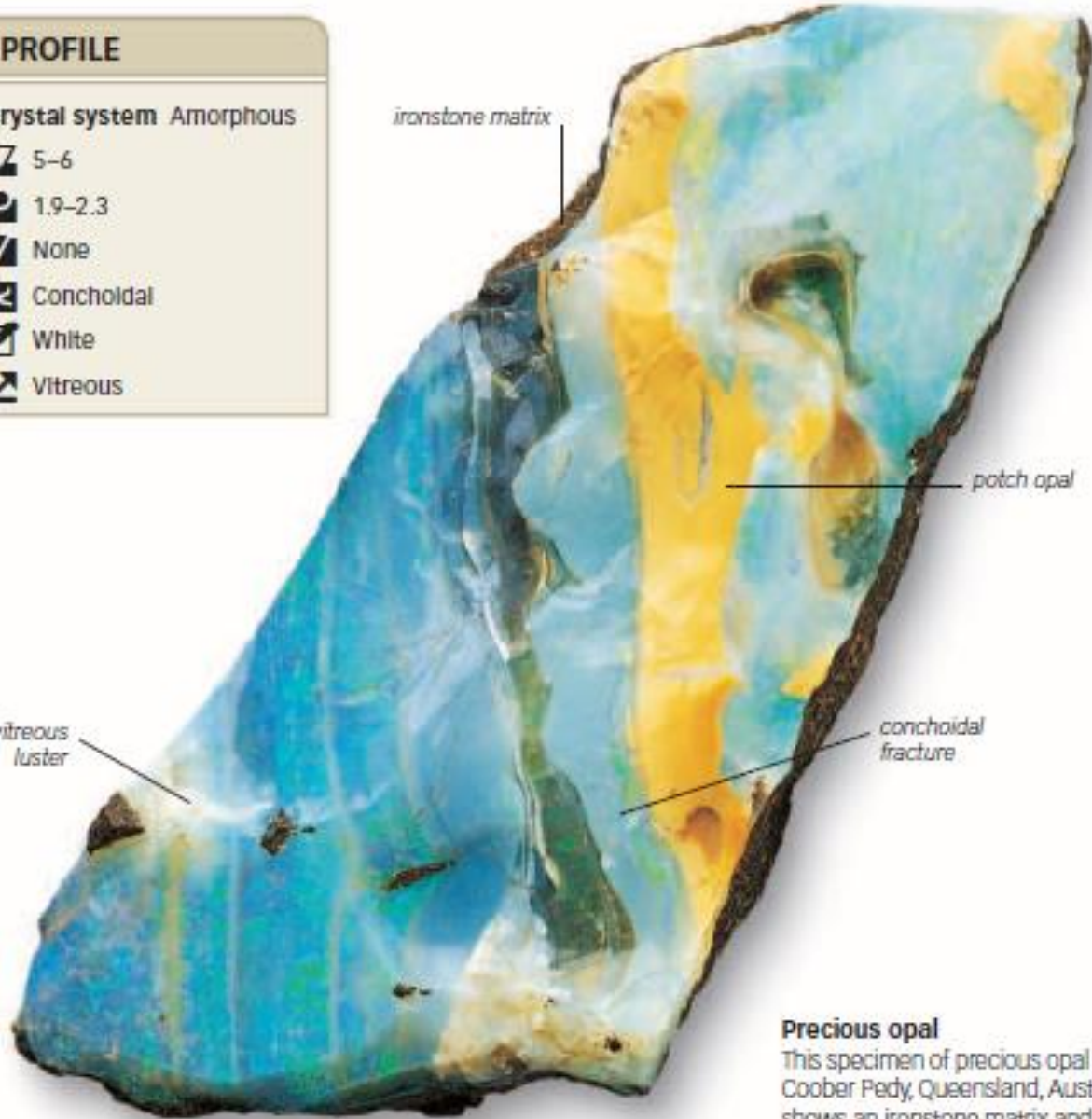
Vitreous

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



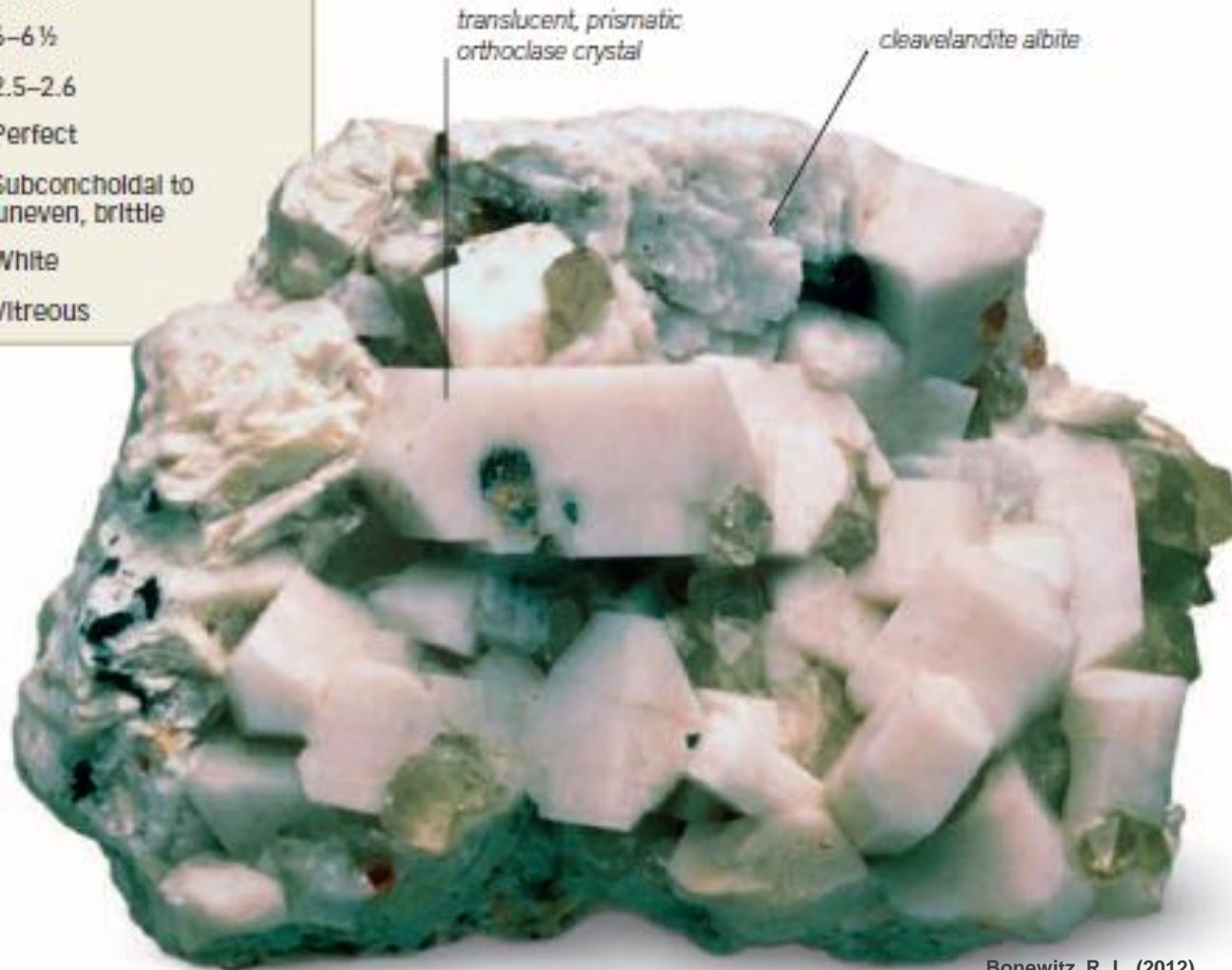
White



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

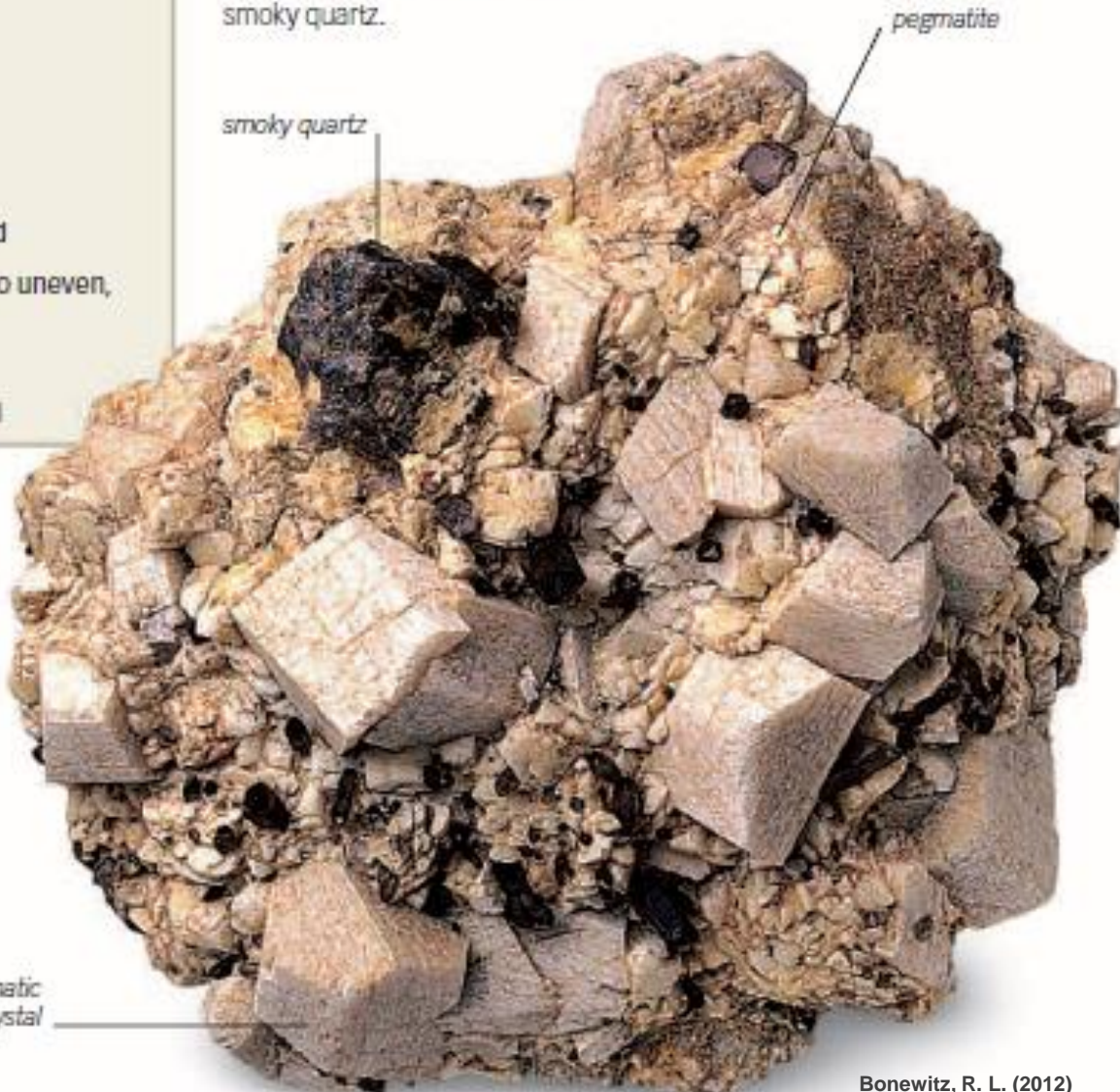
Prismatic microcline

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

smoky quartz

pegmatite

blocky, prismatic
crystal

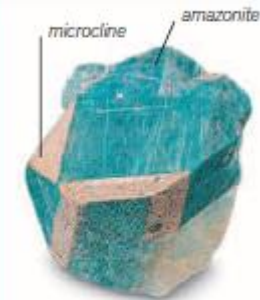


Bonewitz, R. L. (2012)

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

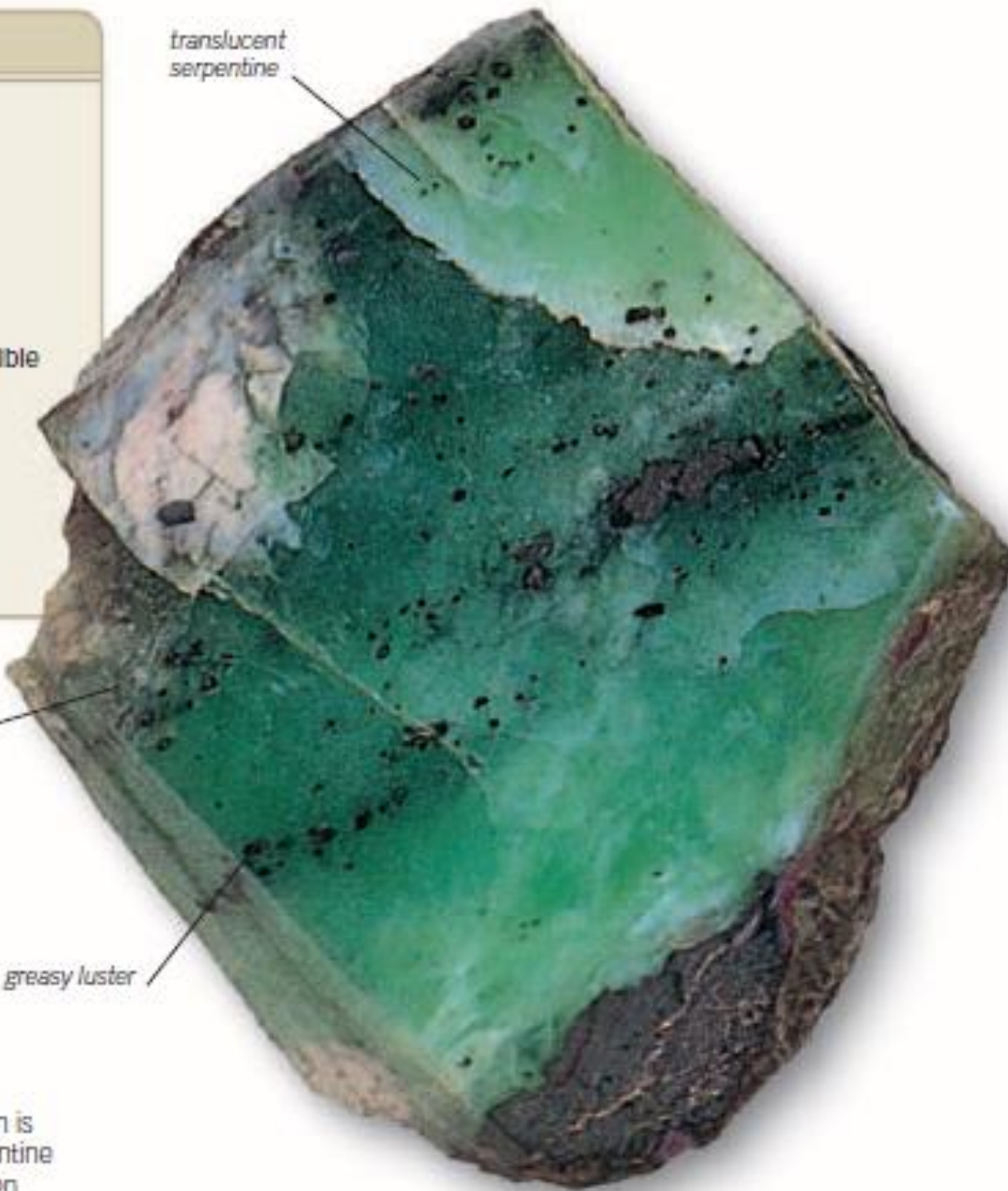
White

Subvitreous to greasy, resinous, earthy, dull

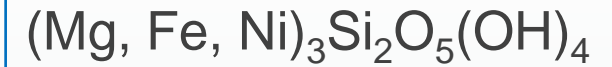
translucent serpentine

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)

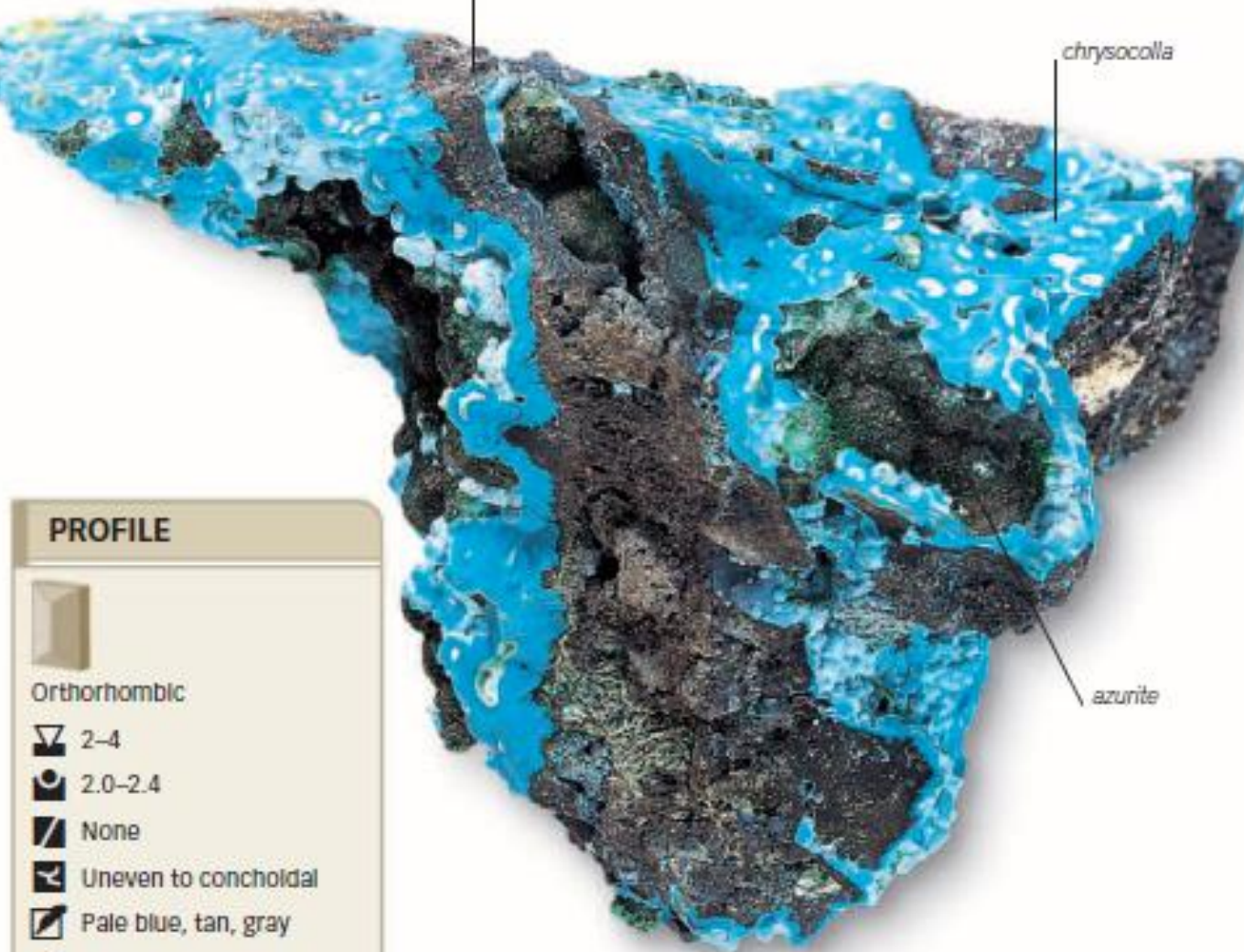
Precious serpentine

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

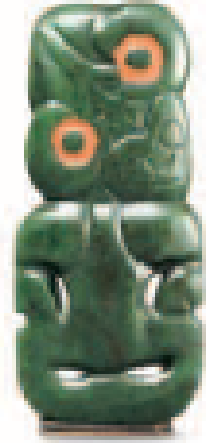
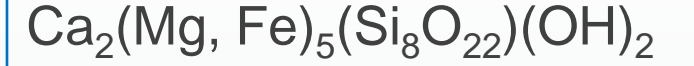
Perfect

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



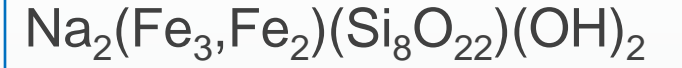
Vitreous, silky

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

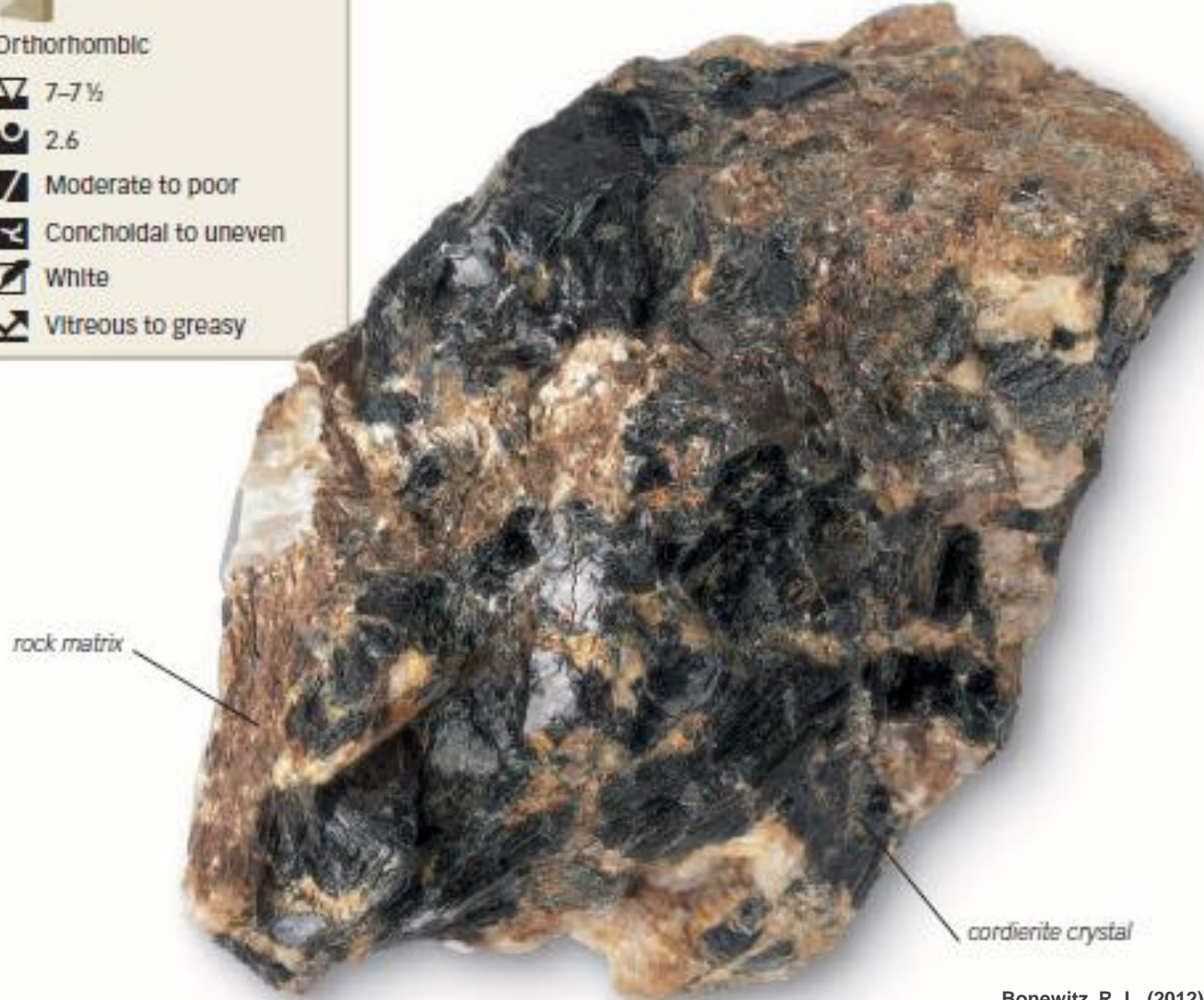
Conchoidal to uneven

White

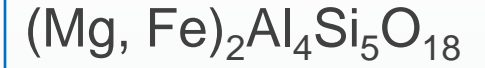
Vitreous to greasy

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)

TURMALİN

PROFILE



Hexagonal or trigonal



7-7½



3.0-3.2



Indistinct



Uneven to conchoidal



Colorless



Vitreous

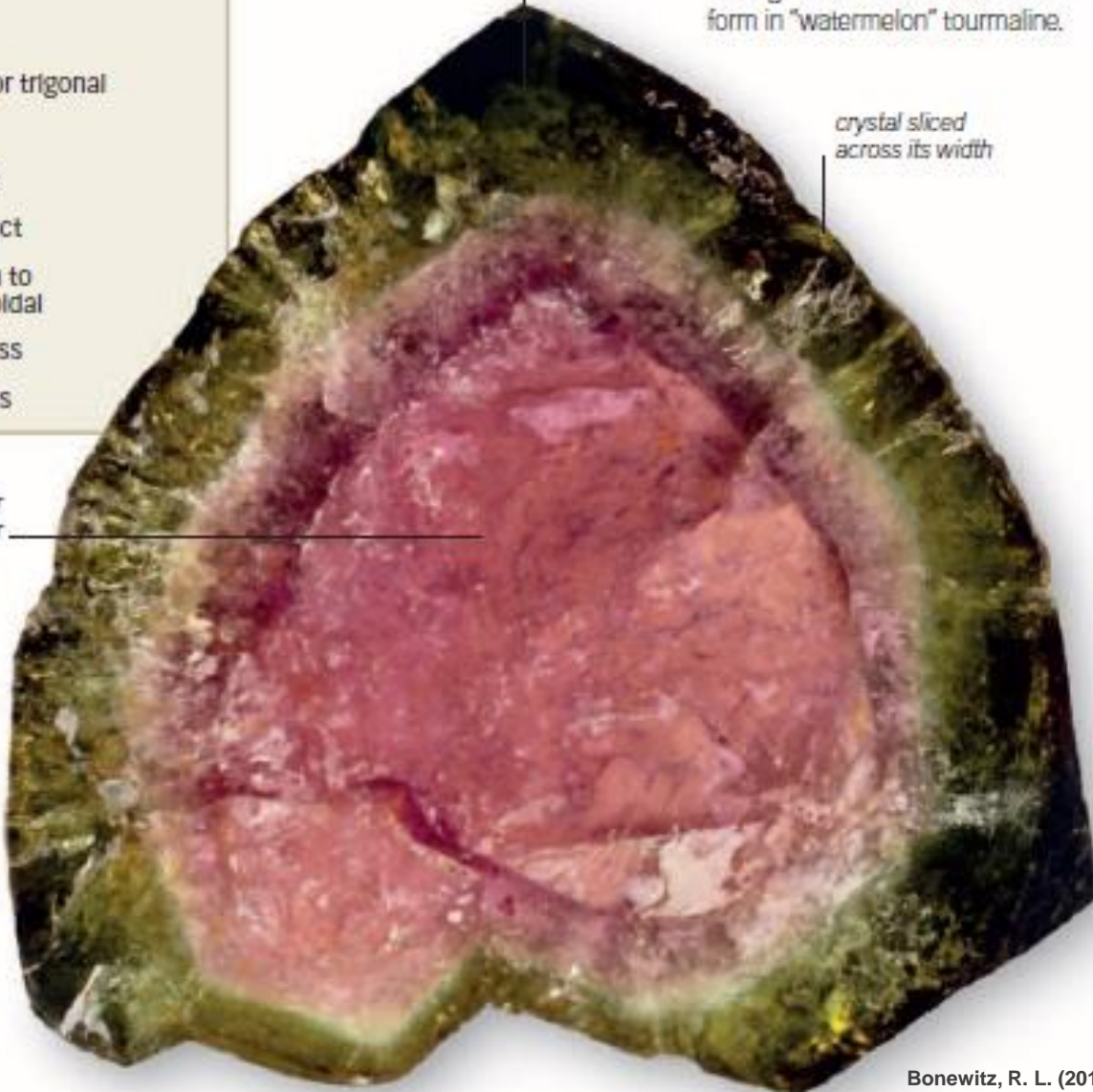
green or red
crystal rim

Watermelon tourmaline

Color can vary either along or across a tourmaline crystal. This zoning takes its most dramatic form in "watermelon" tourmaline.

crystal sliced
across its width

red or
pink center



Bonewitz, R. L. (2012)

Kimyasal Formülü

FeWO_4



Schorl Probably the most common tourmaline mineral



Elbaite A gemstone-quality variant of tourmaline



Indicolite A blue-colored variant of tourmaline



Cut rubellite

This specimen shows the rich red coloration and transparency found in some specimens of rubellite.

BERİL

PROFILE



Hexagonal or trigonal



7 1/2–8



2.6–2.8



Indistinct



Uneven to conchoidal



White



Vitreous

Aquamarine

This mass of prismatic aquamarine crystals is from the Karakoram Range in Pakistan. The name aquamarine means "seawater."

vitreous luster

transparent sky blue

iron-stained coating



Kimyasal Formülü

MnWO_4

VARIANTS



Helliodor Crystalline helliodor with hexagonal prisms



Emerald
An unusually long prismatic crystal of emerald



Morganite A variant with crystals in shades of pink

Bonewitz, R. L. (2012)

AKSİNİT

PROFILE



Triclinic

6½–7

3.2–3.3

Good, poor

Uneven to conchoidal, brittle

Colorless to light brown

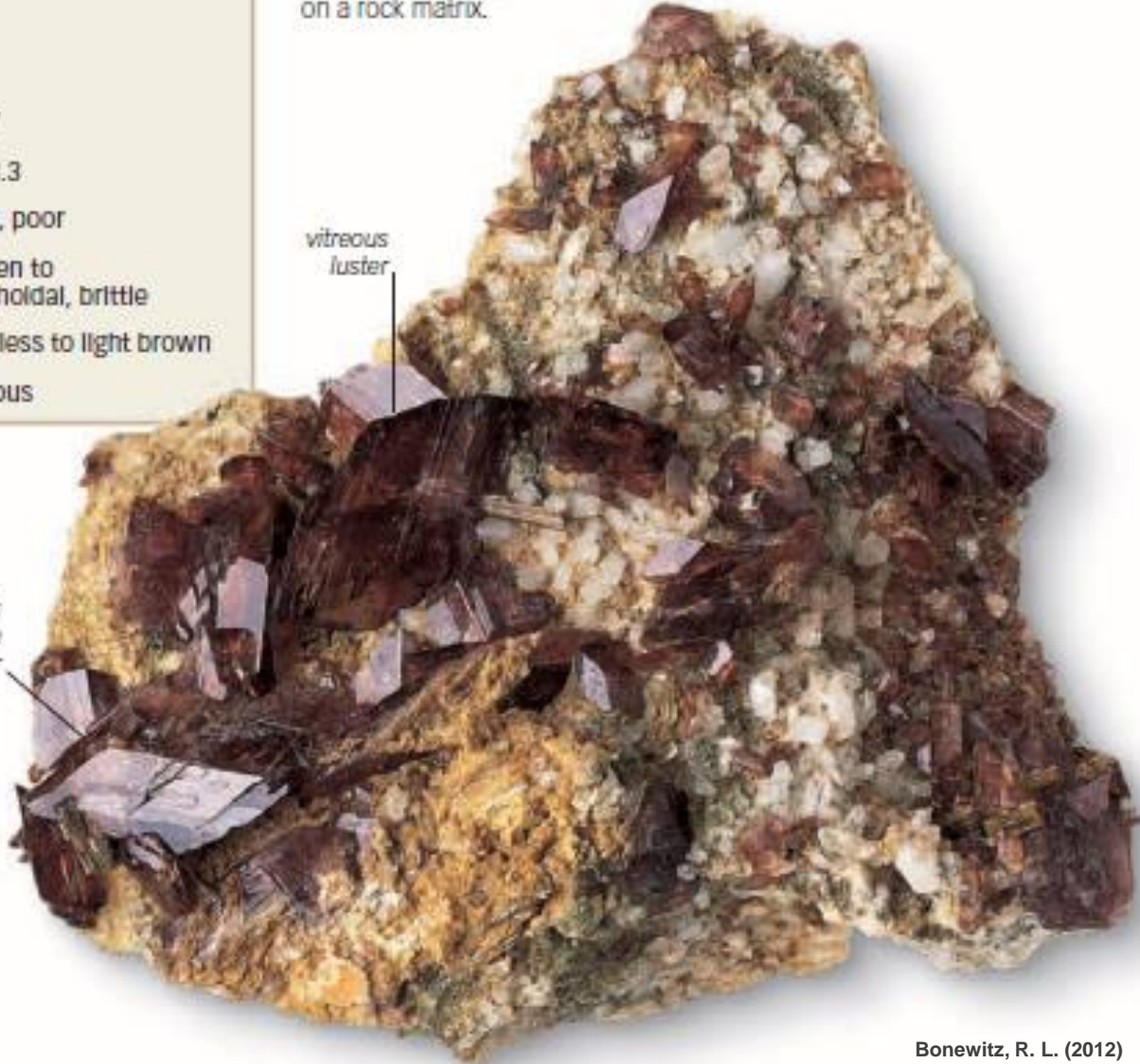
Vitreous

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

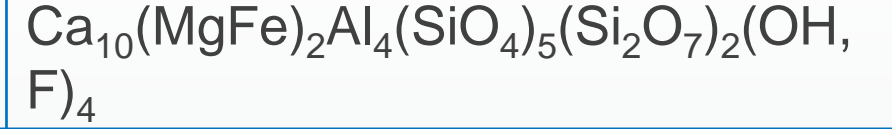
Vitreous to resinous

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.

Bonowitz, 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



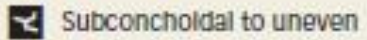
8



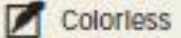
3.4-3.6



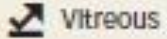
Perfect basal



Subconchoidal to uneven



Colorless



Vitreous

prismatic crystal

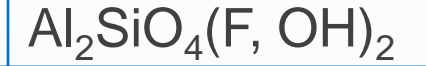
albite

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



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



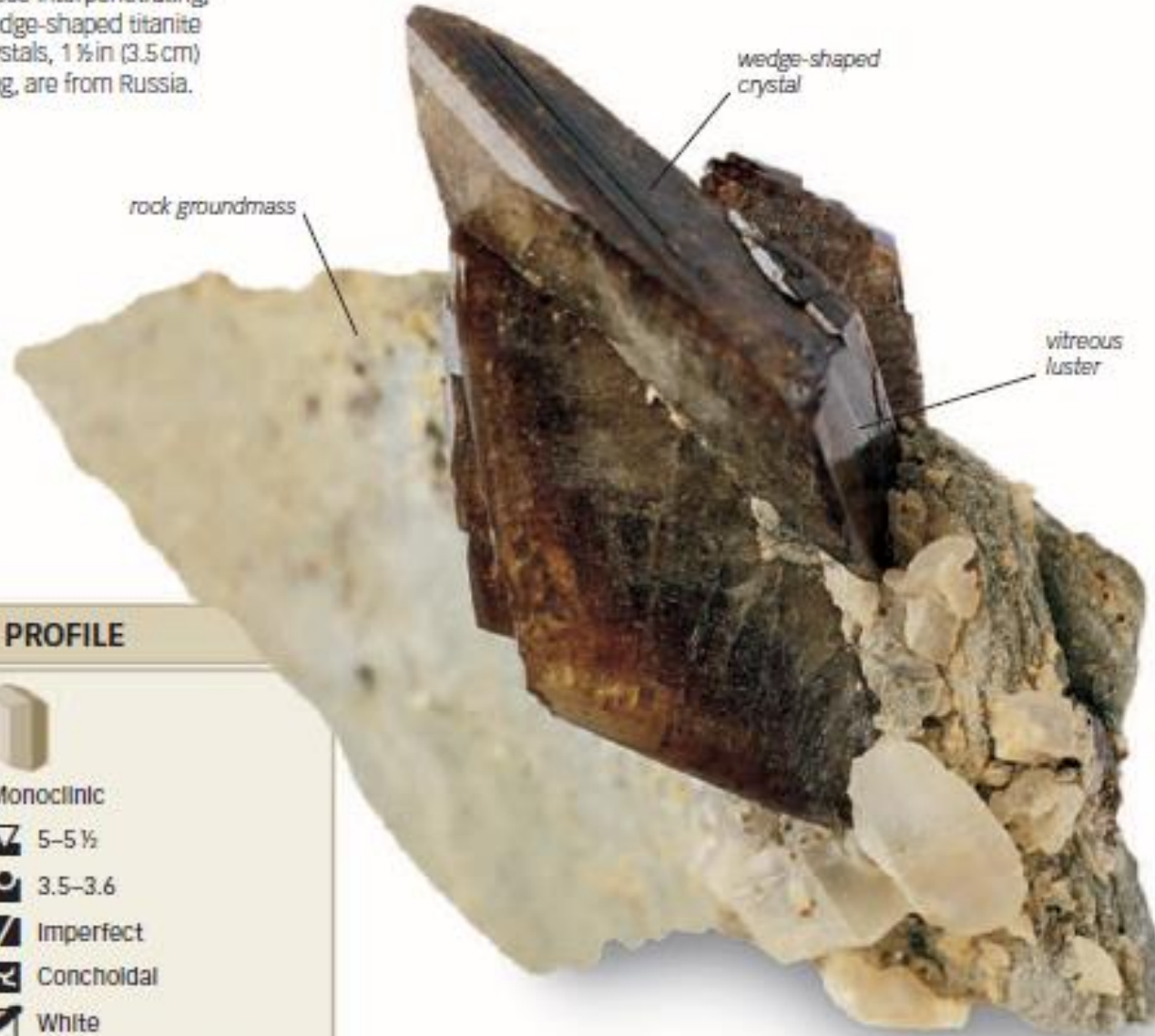
Pink topaz

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.

prismatic andalusite crystal

quartz matrix



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

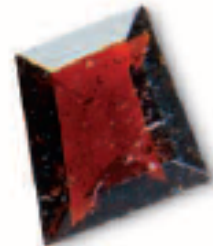
This is a specimen of staurolite in a mica schist matrix. Single and twinned crystals can be seen here.

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

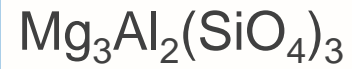
None

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

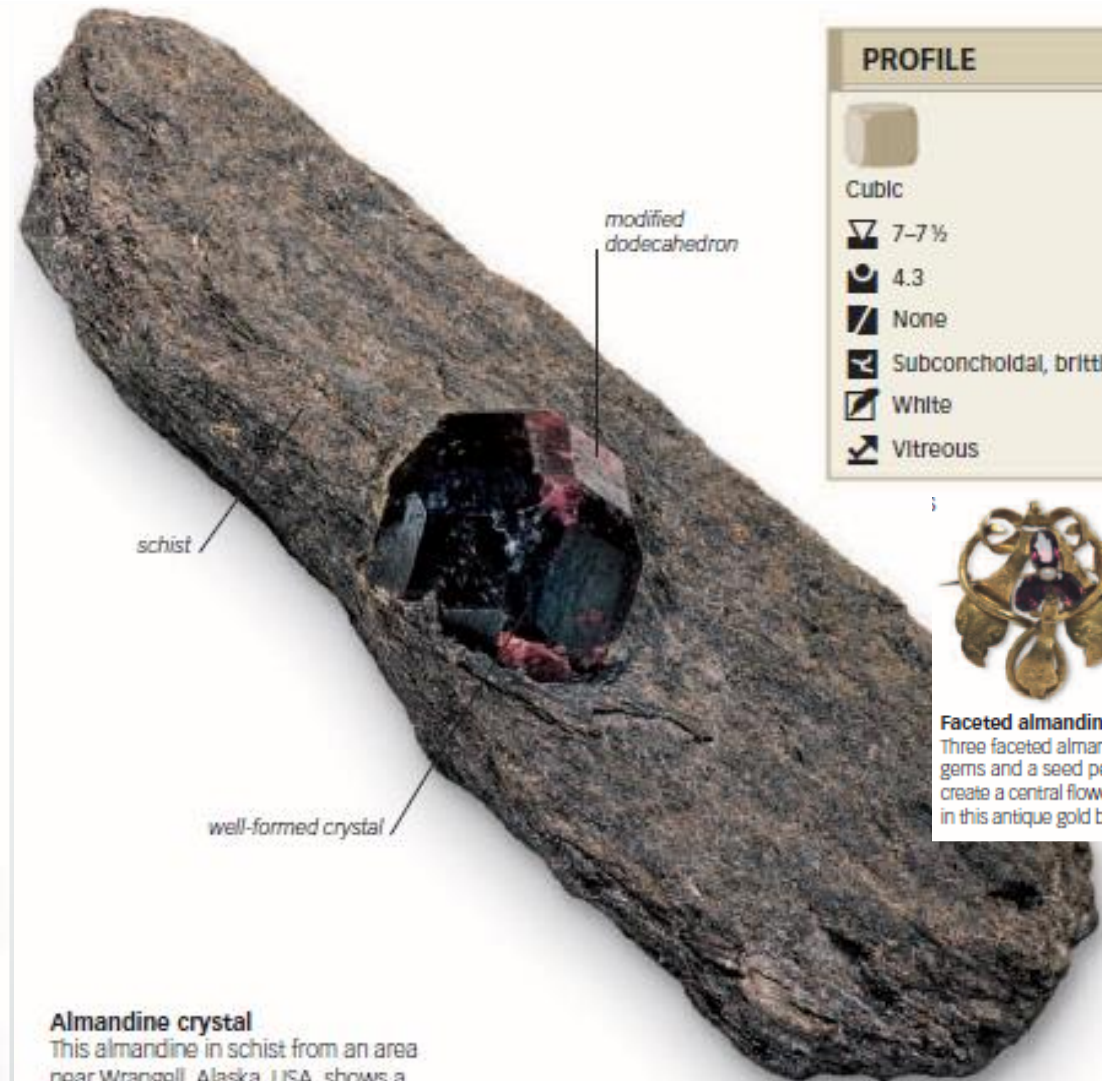
4.3

None

Subconchoidal, brittle

White

Vitreous



schist

modified
dodecahedron

well-formed crystal

Almandine crystal

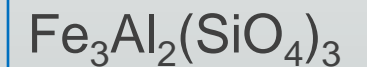
This almandine in schist from an area near Wrangell, Alaska, USA, shows a modified dodecahedral form.



Faceted almandine

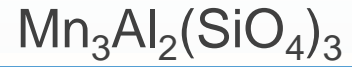
Three faceted almandine gems and a seed pearl create a central flower motif in this antique gold brooch.

Kimyasal Formülü



GRANAT

Kimyasal Formülü



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

rock matrix

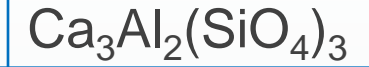
uneven fracture

dodecahedral spessartine crystal



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

Kimyasal Formülü



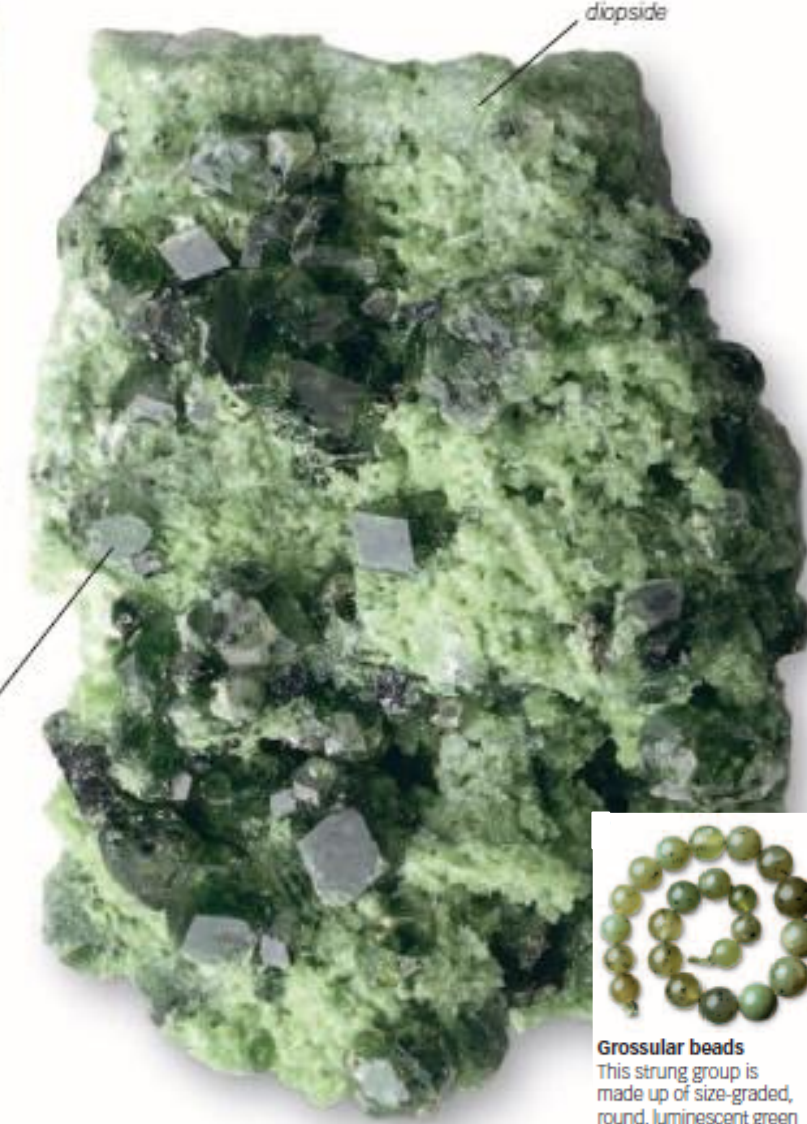
PROFILE



Cubic

-  6 1/2-7
-  3.6
-  None
-  Conchoidal
-  White
-  Vitreous

grossular crystal



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

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

Bonewitz, R. L. (2012)

MERCAN

PROFILE



Trigonal



Orthorhombic

Amorphous

3½

2.6-2.7

None

Hackly

White

Dull to vitreous



Bonewitz, R. L. (2012)

Kimyasal Formülü

CaCO_3

VARIANTS

Blue coral

A type of coral used in artifacts and jewelry



Black coral

A variant that is polished to make jewelry

Brain coral

An elaborate confection of organic aragonite



Coral necklace

This triple-stranded necklace from Morocco is made of coral, silver, and turquoise.

Red coral

The use of red coral dates back to the Iron Age. This specimen from the Mediterranean has a wood-grain pattern on its branches.

İNCİ

PROFILE



Orthorhombic



3



2.7



None



Uneven, brittle



White

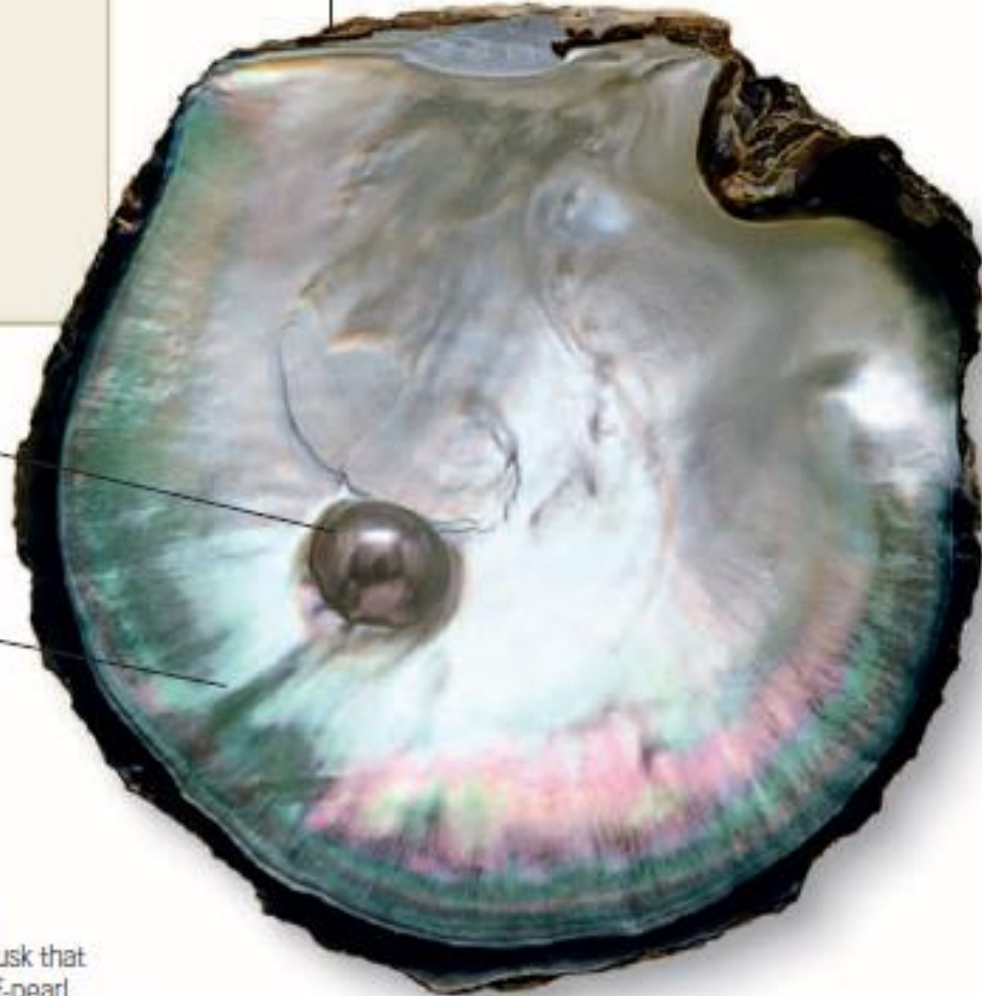


Pearly

conchiolin covering

black pearl

iridescent
mother-of-pearl



Black mother-of-pearl

The black-lip shell, a mollusk that produces black mother-of-pearl, also produces black cultured pearls.

Bonewitz, R. L. (2012)

Kimyasal Formülü

CaCO_3



Pearl bracelet

This Cartier Art Deco bracelet has five strands of cultured pearls with a gold and oxidized-silver clasp.

KAVKI

PROFILE



Hexagonal



Orthorhombic

Amorphous



2 1/2



About 1.3



None



Conchoidal



White



Dull to vitreous

iridescent
mother-of-pearl



inner surface
of shell

Abalone shell

Found in warm seas, abalone shells, such as this one from New Zealand, are noted for their multicolored, iridescent, mother-of-pearl lining.

Kimyasal Formülü

CaCO_3



Shell perfume bottle

This 19th-century perfume bottle is made of two shells glued together. It has a chain, ring, and pinchbeck stopper.

Bonewitz, R. L. (2012)

REÇİNE

PROFILE

Crystal system None

2-2½

About 1.1

None

Conchoidal

White

Resinous



Copal nugget

This specimen of copal closely resembles amber. Some copal is used as an amber substitute in jewelry.

Bonewitz, R. L. (2012)



Copal beads

In this necklace, beads of a tough and compact form of copal alternate with beads carved from seeds.

KEHRİBAR

PROFILE

Crystal system None

2-2½

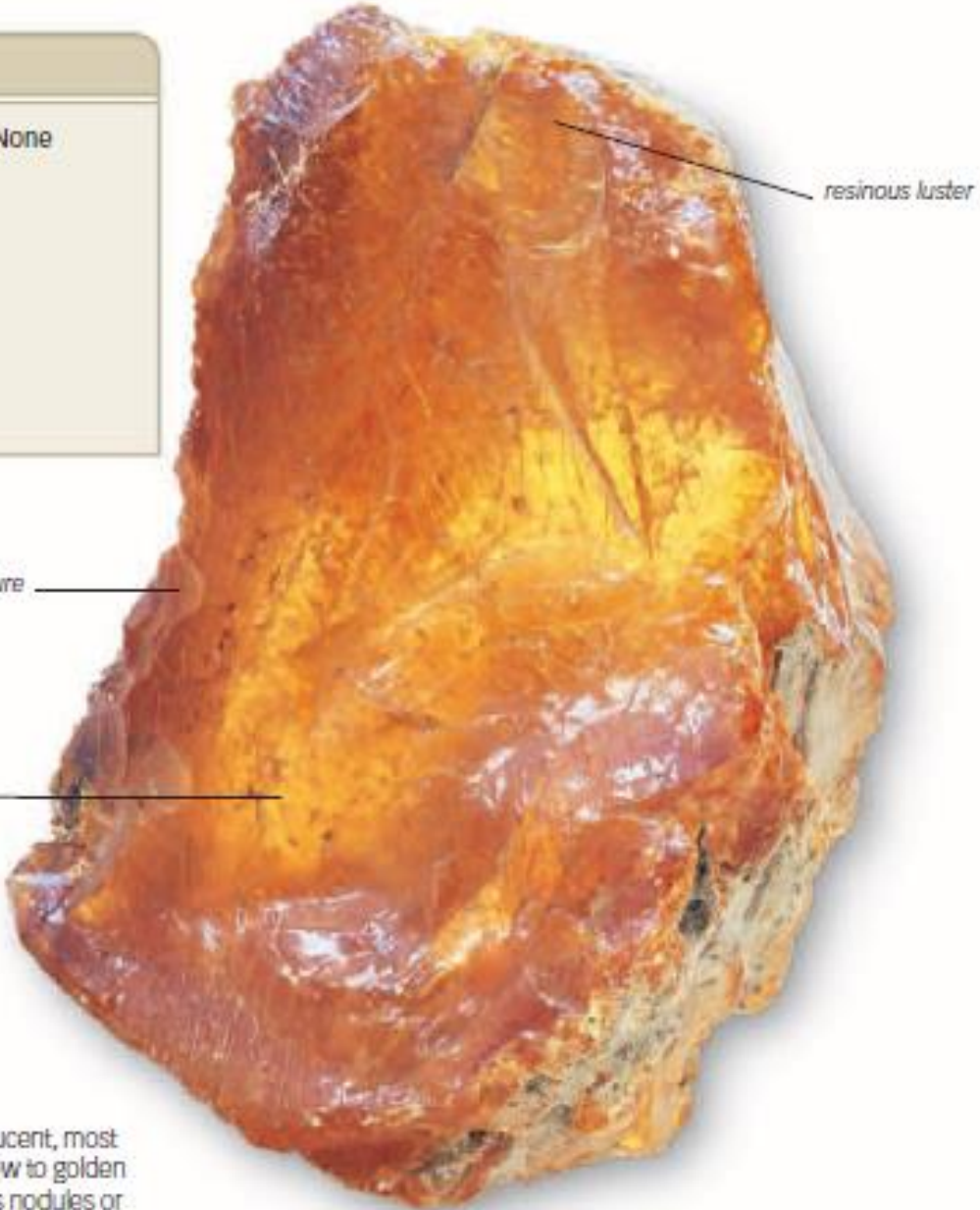
1.1

None

Conchoidal

White

Resinous



Kimyasal Formülü C, H, O

Amber nodule
Transparent to translucent, most amber is golden yellow to golden orange and occurs as nodules or small, irregularly shaped masses.

Bonewitz, R. L. (2012)



Preserved in amber
As resin dried 40-50 million years ago, insects were sometimes fossilized within the sticky substance.

OLTUTAŞI

PROFILE

Crystal system None

▽ 2 ½

○ About 1.3

▣ None

⊞ Conchoidal

▣ Black to dark brown

⊞ Velvety, vitreous,
or waxy

bedded structure

vitreous luster

Woody structure

This specimen of jet shows the layered, woody structure that is sometimes characteristic of the mineral.



Bonewitz, R. L. (2012)



Jet necklace

This Native American necklace is made of high-quality, fine-grained jet, which shows velvety luster.

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