



T.C.  
Ankara Üniversitesi  
Mühendislik Fakültesi  
Jeoloji Mühendisliği Bölümü



# JEM 227 GEMOLOJİ

Dr. Öğr. Üyesi Kıymet DENİZ

2. Hafta

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

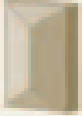


# DIYASPOR

Kimyasal Formülü

$\text{AlO(OH)}$

## PROFILE



Orthorhombic

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

 3.4

 Perfect, Imperfect

 Conchoidal, brittle

 White

 Vitreous



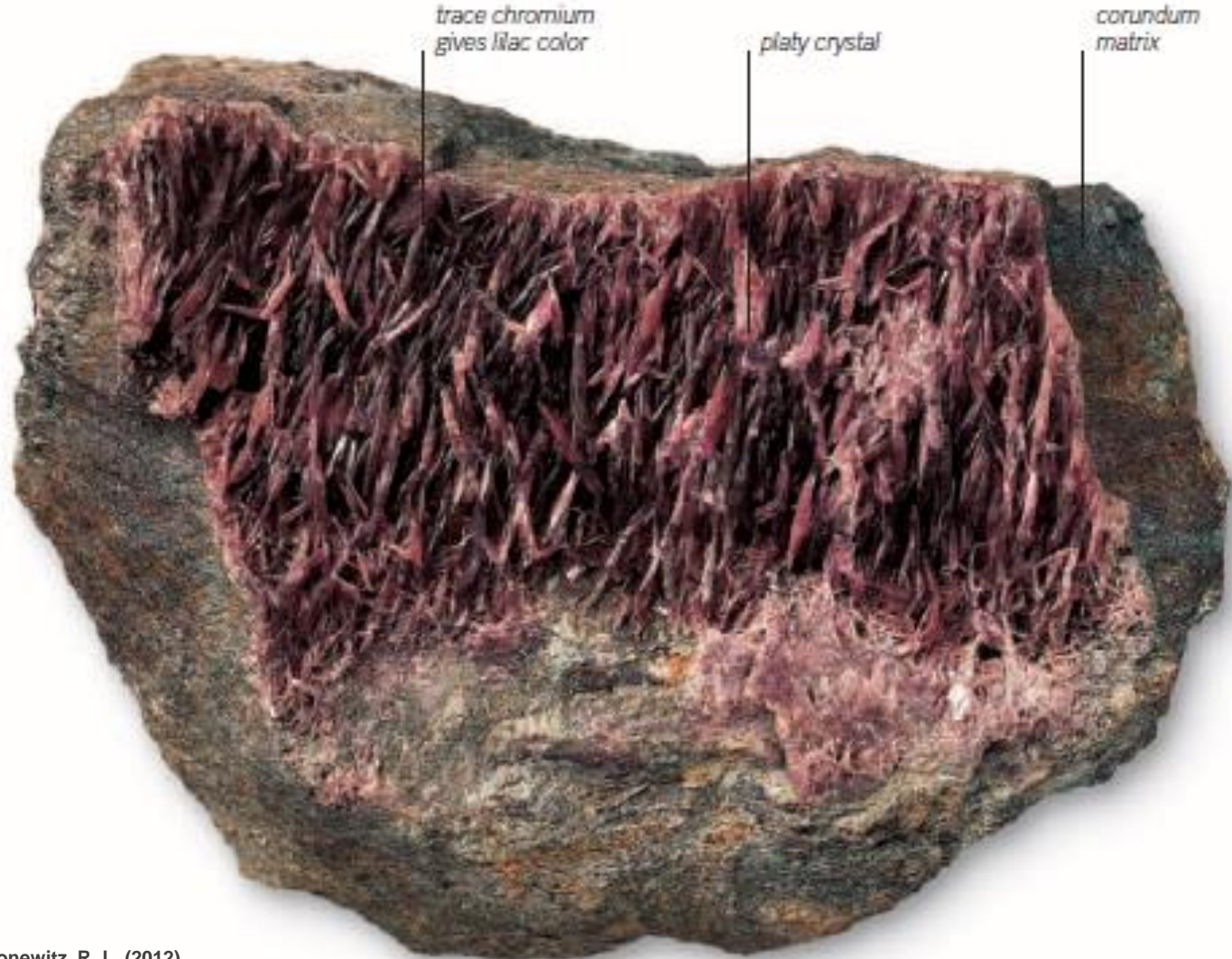
### Faceted gem

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.

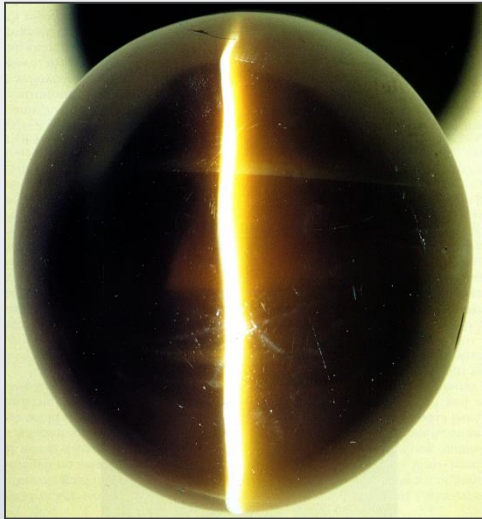


Bonowitz, R. L. (2012)



# 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.



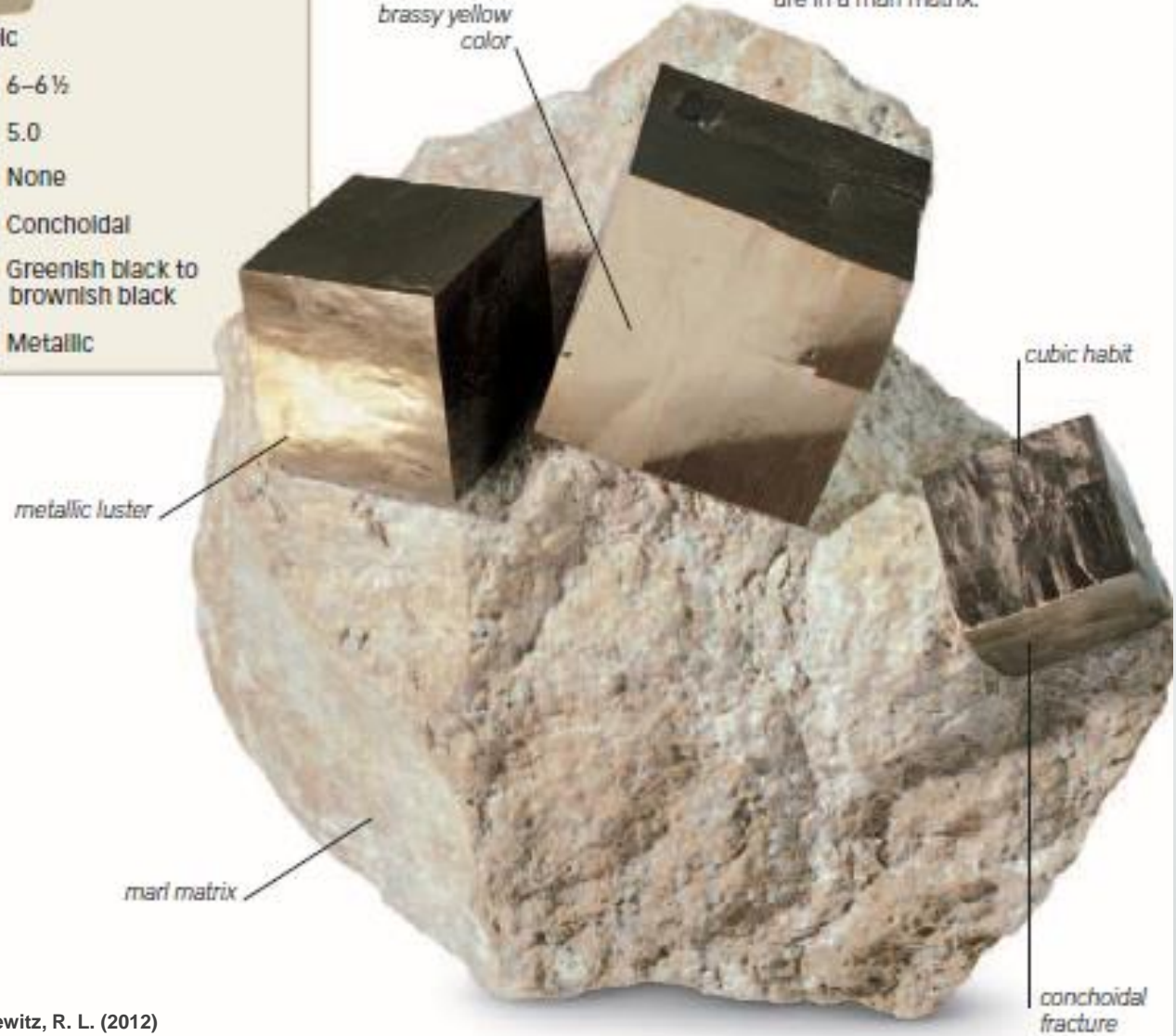
Bonewitz, R. L. (2012)

# PIRİT

Kimyasal Formülü  $\text{FeS}_2$

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  $\text{FeS}_2$

## 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)

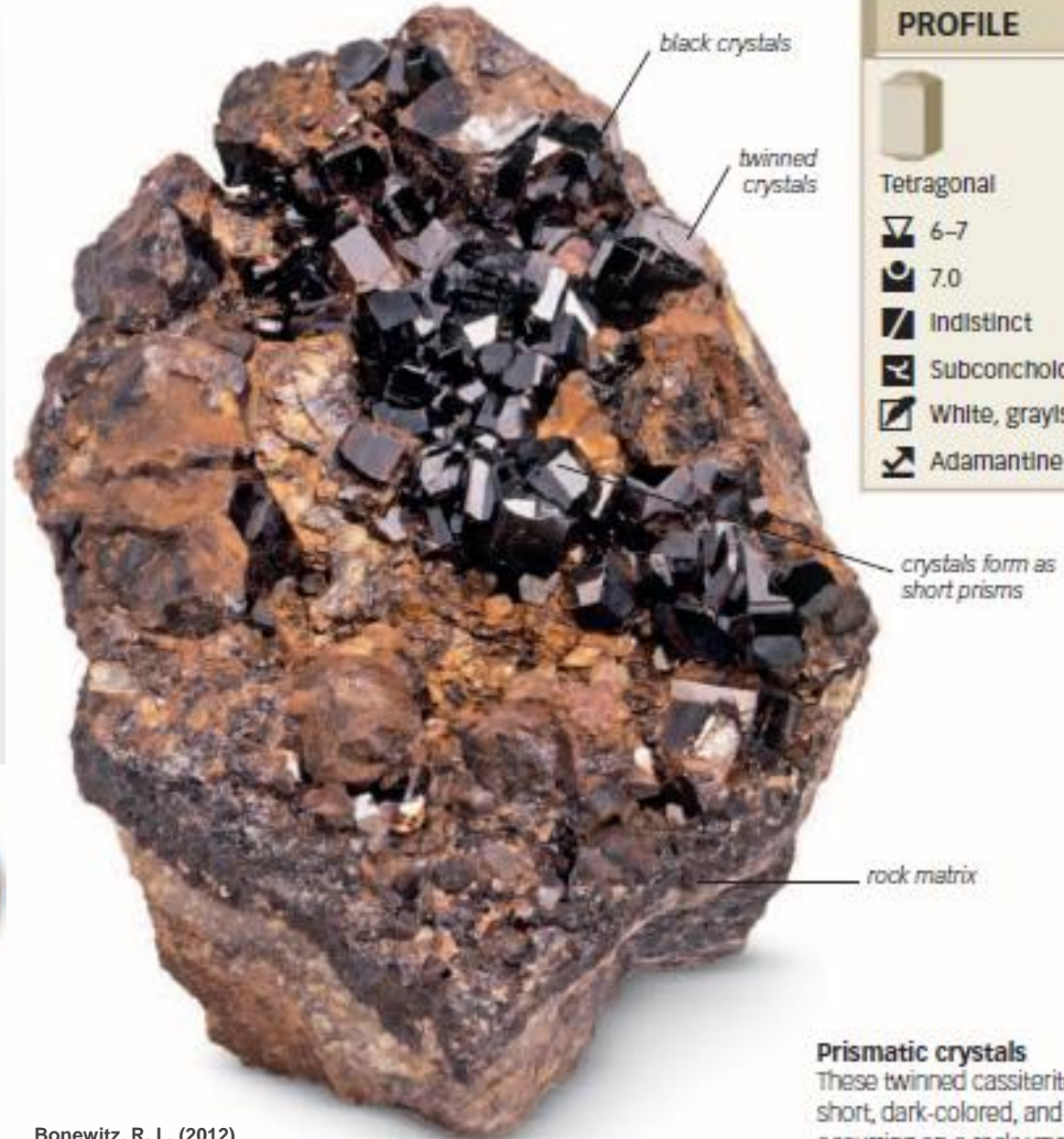


### Marcasite crystals

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  $\text{SnO}_2$



## 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)

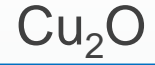
### Prismatic crystals

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.

translucent red

Bonowitz, R. L. (2012)

# 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."

Bonowitz, 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

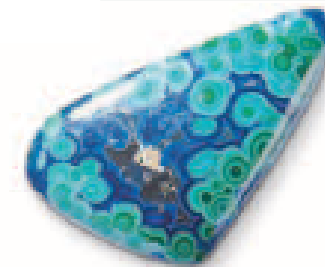
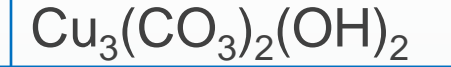
In this specimen of azurite, large, well-formed crystals rest on a goethite matrix.

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.



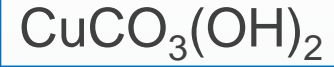
### Cabochon

Soft smithsonite is  
occasionally cut into  
cabochon gemstones  
for collectors.



# MALAKİT

Kimyasal Formülü



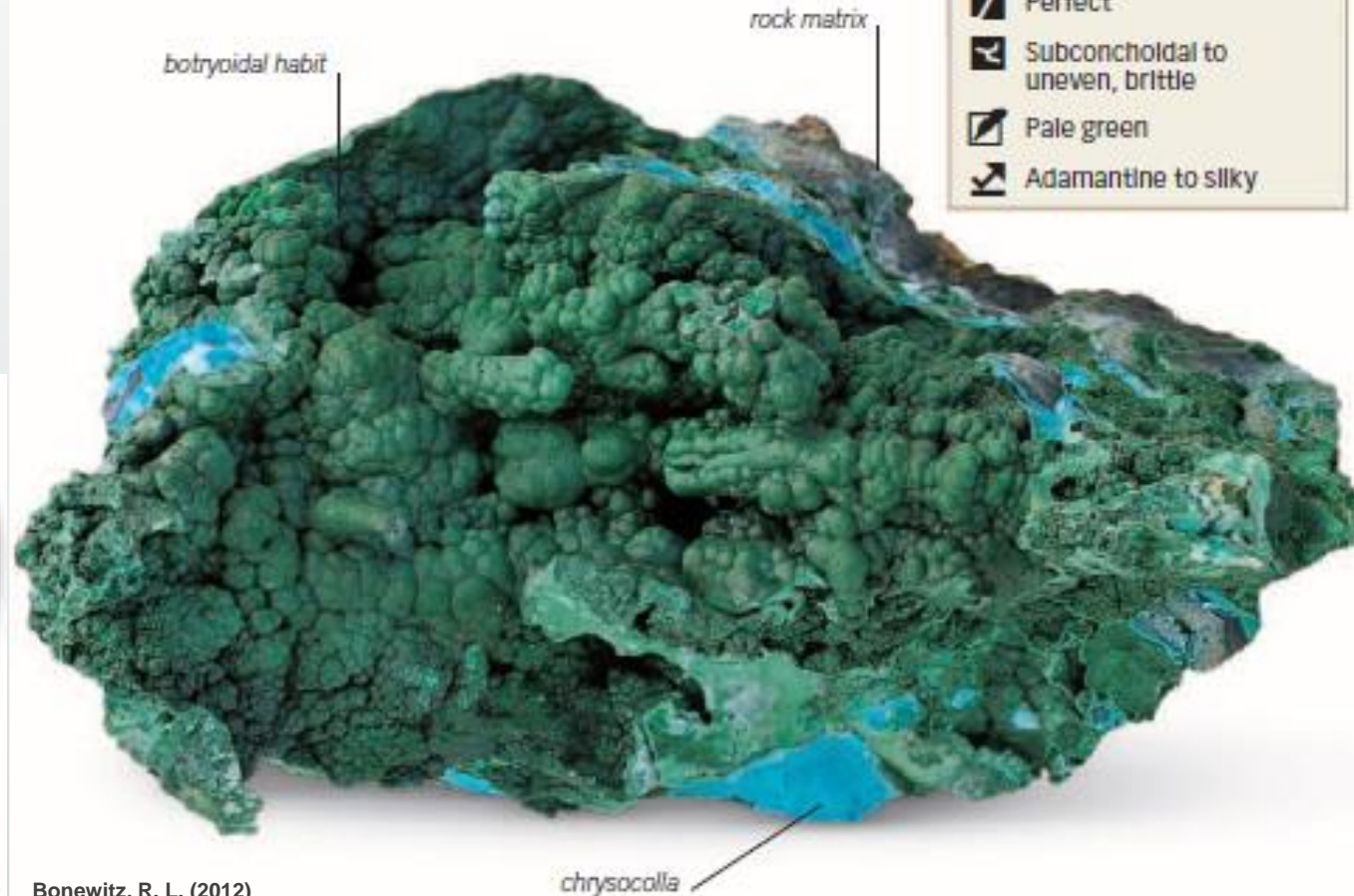
## Botryoidal malachite

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

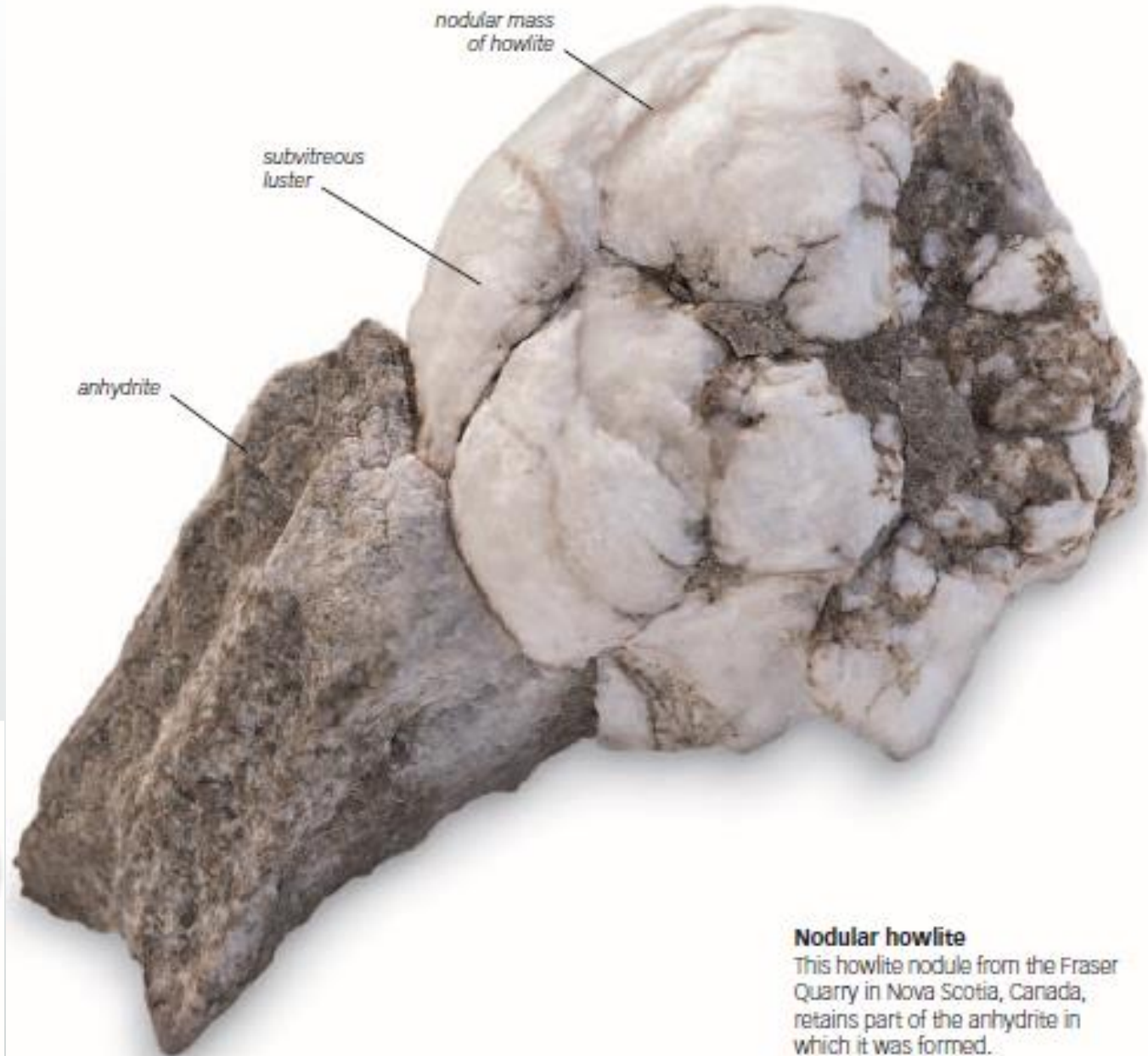
Conchoidal to uneven

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.

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$PbSO_4$

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

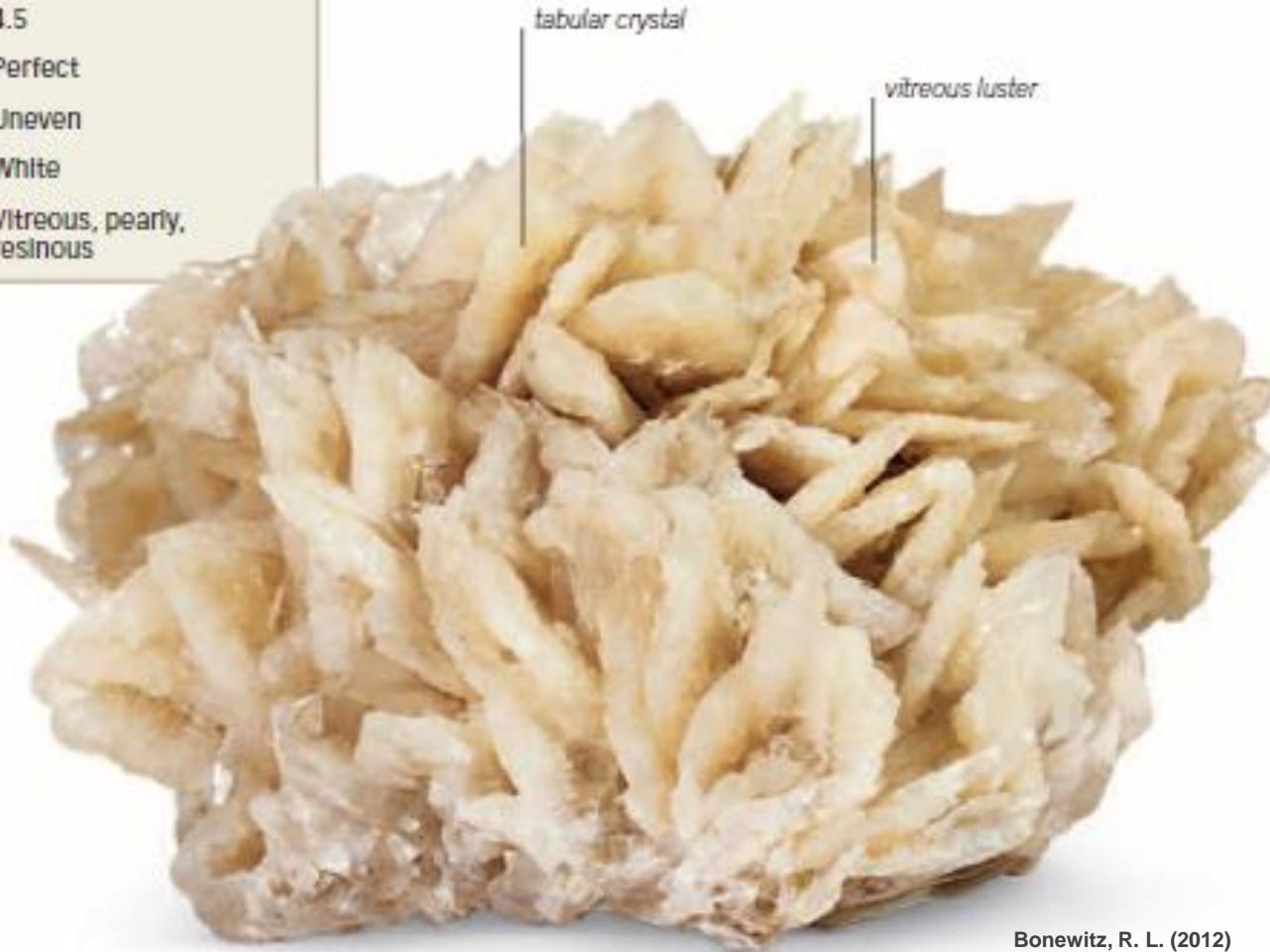
Uneven

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<sub>4</sub>



### 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

$\text{SrSO}_4$



### Collector's gem

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

Bonewitz, R. L. (2012)

## PROFILE



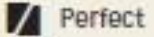
Monoclinic



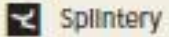
2



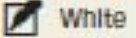
2.3



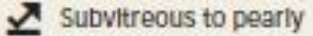
Perfect



Splintery



White



Subvitreous to pearly

attachment point

vertical striations

pearly luster

termination face

Kimyasal Formülü

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

### Selenite 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

$\text{CaWO}_4$

## PROFILE



Tetragonal

4½–5

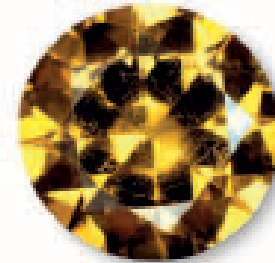
6.1

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

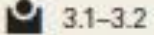
## PROFILE



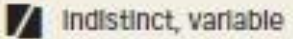
Monoclinic



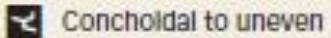
5



3.1-3.2



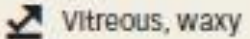
Indistinct, variable



Conchoidal to uneven



White



Vitreous, waxy

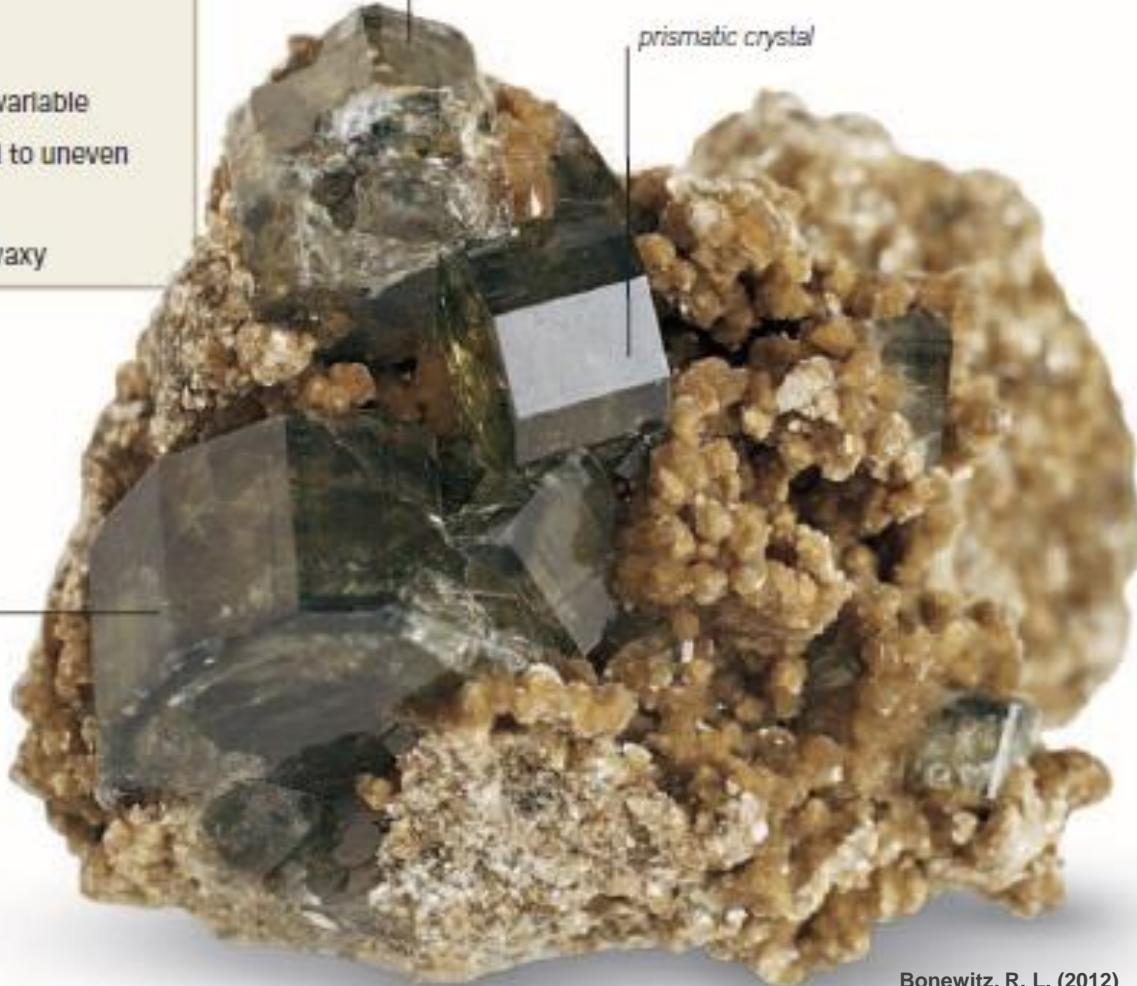
## Apatite crystals

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



Bonowitz, 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.

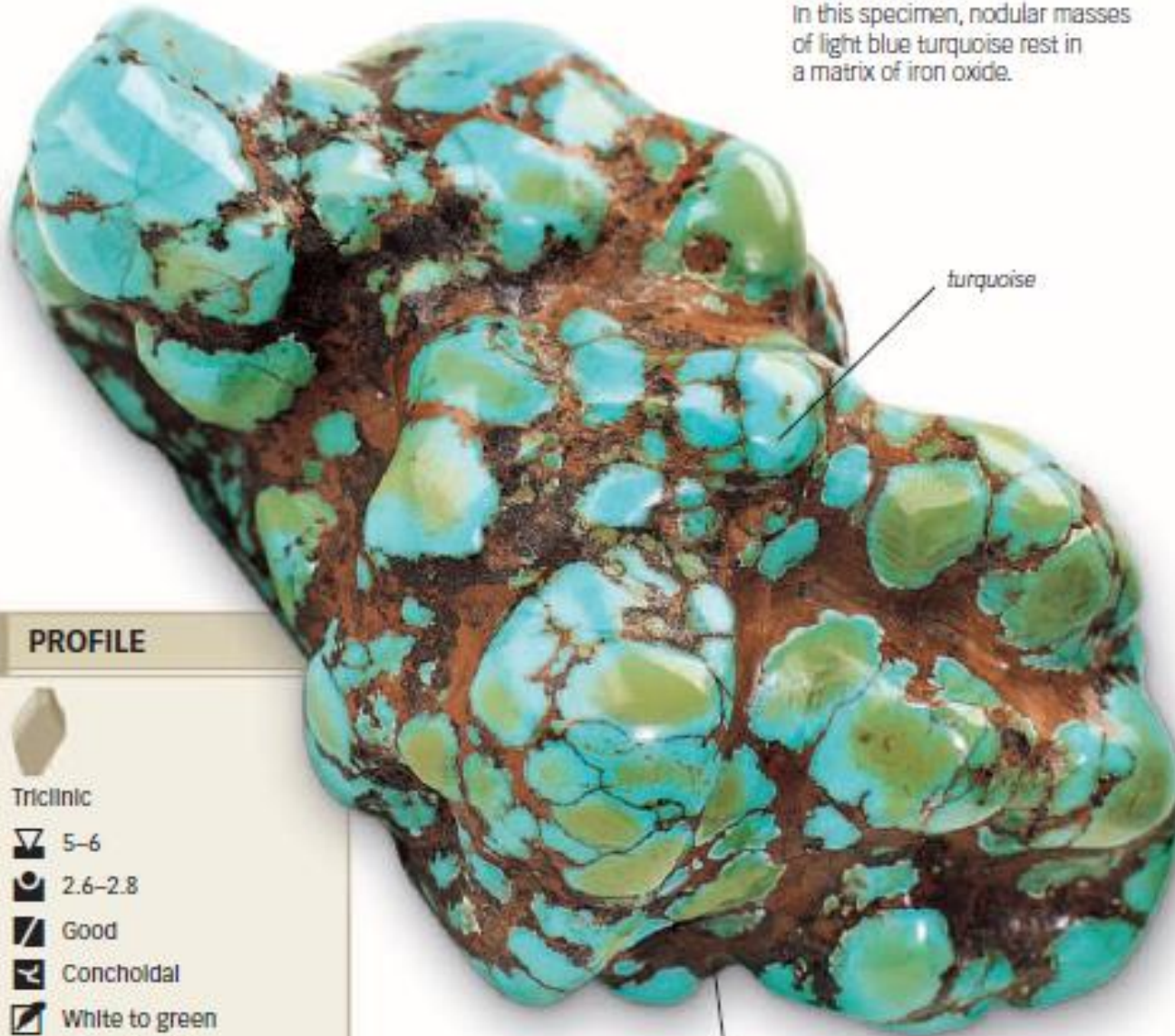
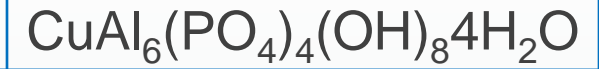


# TURKUAZ

## Blue turquoise

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

Kimyasal Formülü



turquoise

iron-oxide matrix

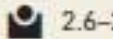
## PROFILE



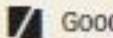
Triclinic



5-6



2.6-2.8



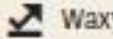
Good



Conchoidal



White to green



Waxy to dull



## Carved elephant

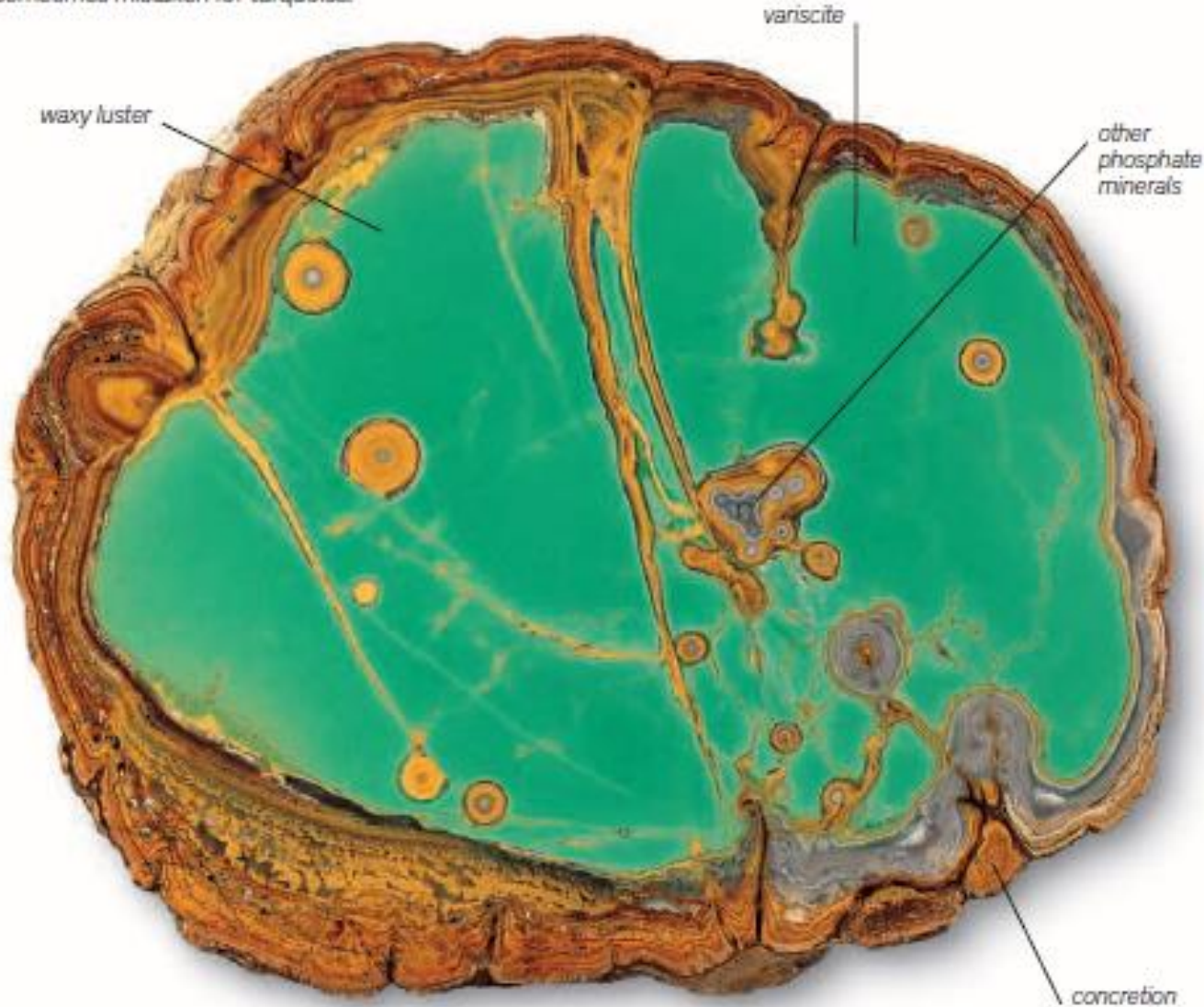
Turquoise is a favorite of Chinese stone carvers, who produced this turquoise elephant.

Bonewitz, 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


 4½

 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.



# TURMALİN

## PROFILE



Hexagonal or trigonal



7-7½



3.0-3.2



Indistinct



Uneven to conchoidal



Colorless



Vitreous

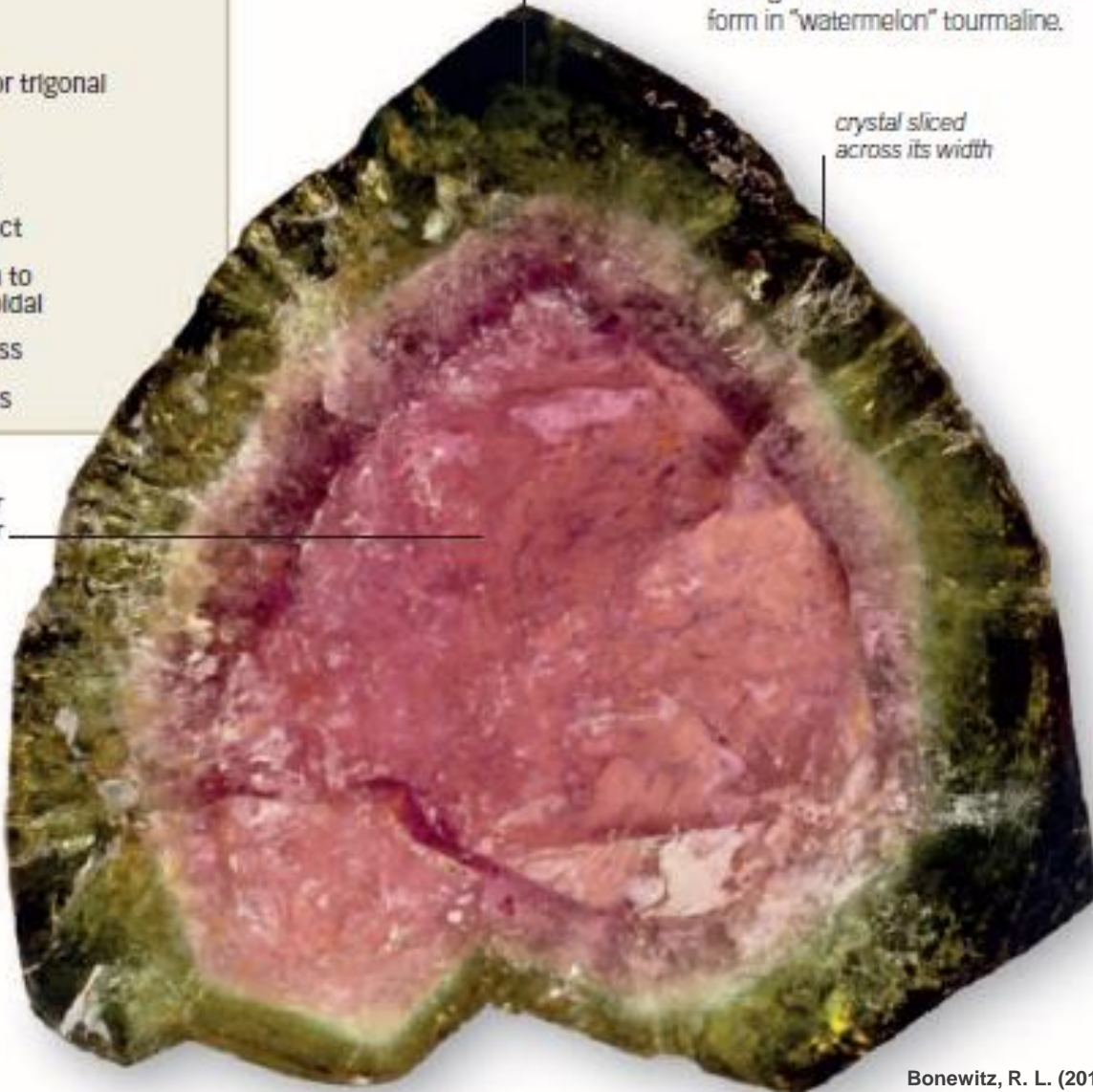
green or red  
crystal rim

### 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



## Kimyasal Formülü

$\text{FeWO}_4$



**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.

Bonewitz, R. L. (2012)

# 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*



## 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

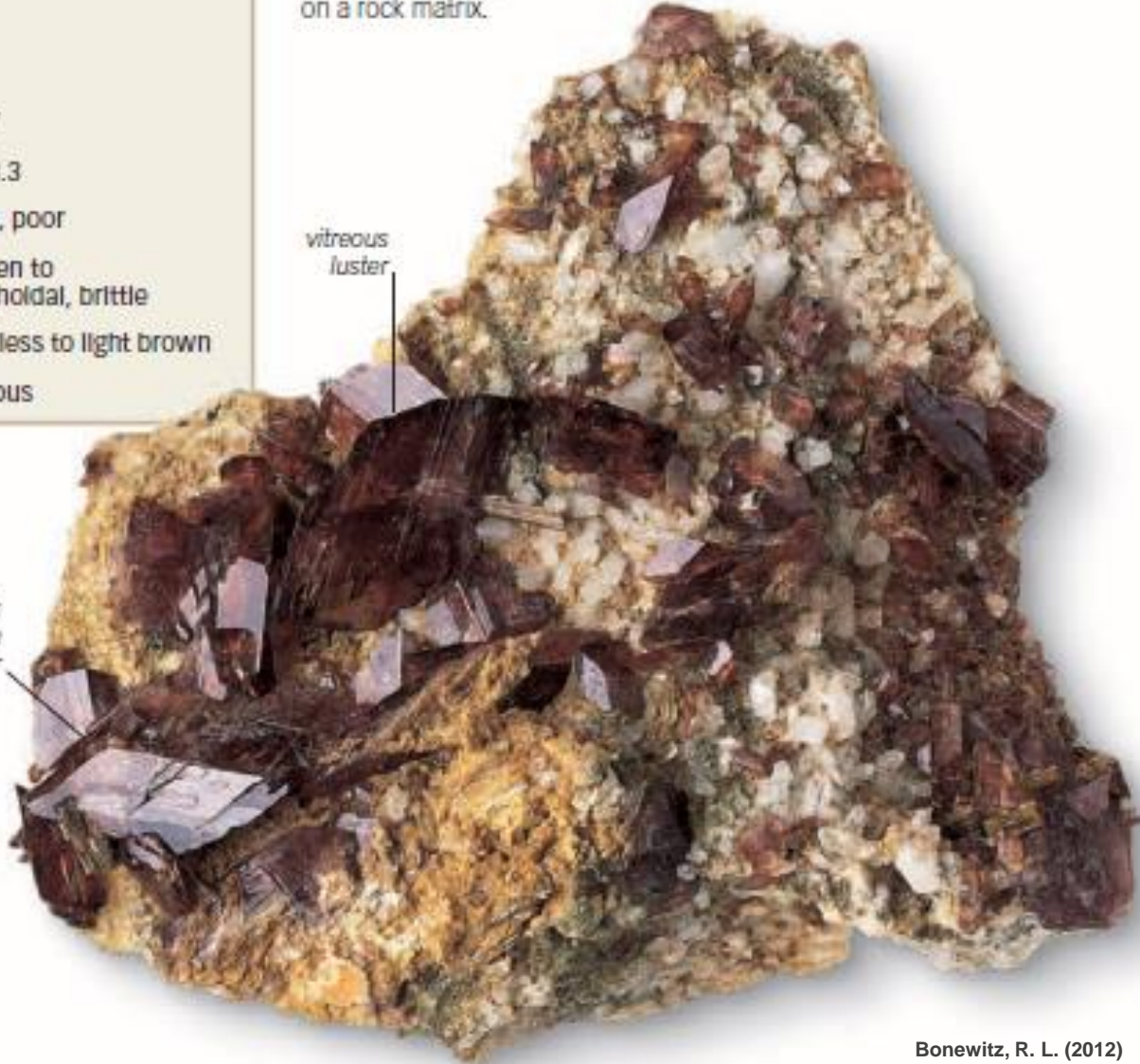
Vitreous

## 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)

# Referanslar

Deniz, K. and Kadiođlu, Y. K., 2015. FTIR, CRS and LA-ICP-MS Characteristics of Different Coloured Fluorites from Central Anatolia (CAF), Turkey. 12<sup>th</sup> International Congress for Applied Mineralogy (ICAM2015), İstanbul-Türkiye.

Kabakcı, B., Deniz, K., Kılıç, C.Ö., Güllü, B., 2012. Fluorit Oluşumunda Alkali Magmatik Kayaların Önemi: İç Anadolu'dan Örnekler, Uluslararası Katılımlı V. Ulusal Jeokimya Sempozyumu, Denizli-Türkiye.

Kadiođlu, Y. K., Dilek, Y. and Foland, K. A., 2006. Slab break-off and syncollisional origin of the Late Cretaceous magmatism in the Central Anatolian crystalline kompleks, Geological Society of America, special paper 409, 381-415.

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Şaşmaz, A. and Yavuz, F., 2007. REE geochemistry and fluid-inclusion studies of fluorite deposits from the Yaylagözü area (Yıldızeli-Sivas) in Central Turkey, N. Jb. Miner. Abh., 183, 2, 215–226.

## İnternet adresleri:

- ➔ <https://crystal-cure.com>
- ➔ <http://www.old-earth.com/>
- ➔ <http://www.healthstones.com>
- ➔ <https://www.google.com.tr>
- ➔ <http://www.ebay.co.uk/>
- ➔ <http://www.edelsteine.de>
- ➔ <http://www.ecrater.com>
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