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BAUXITE Croatian National 'Mineral'

Definition

Bauxite is a product of longlasting (>1 Ma) subaerial weathering formed under humid tropical to subtropical conditions and characterized by residual concentration of hydrous Al, Fe and Ti. It was named after the village of Les Baux by Pierre Berthe, French geologist who found the ore in nearby deposits in 1821.

Indication of:

- · "green-house" period · tectonically controlled uplift and the associated relative sea-level fall
 - · globally high temperatures
 - · concomitant eustatic sea-level high · positive anomalies of worldwide igneous

 - · paleoenvironmental information (for lack of marine sediments)

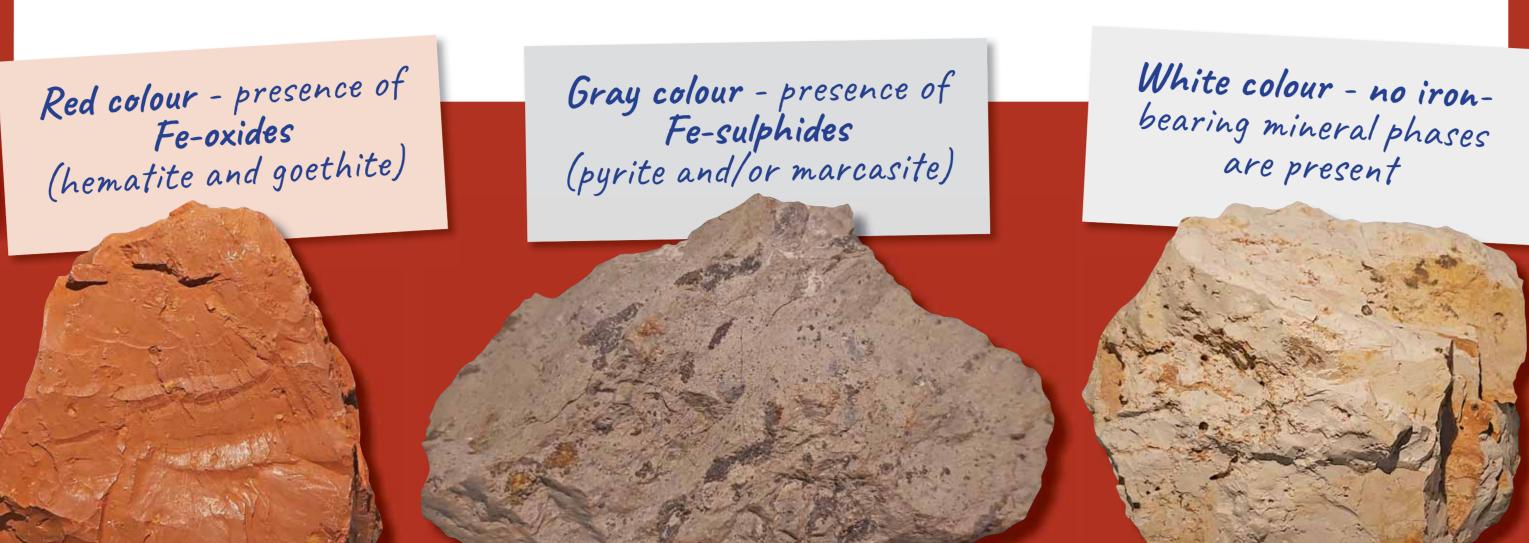
Other definitions:

- · Ferrallitic soil (pedology)
- · Oxisol (palaeopedology)
- Residual rock (geology)

Main Al-containing minerals: gibbsite, boehmite and diaspore

Mineralogy

Gangue minerals: hematite, goethite, quartz, rutile/anatase, kaolinite



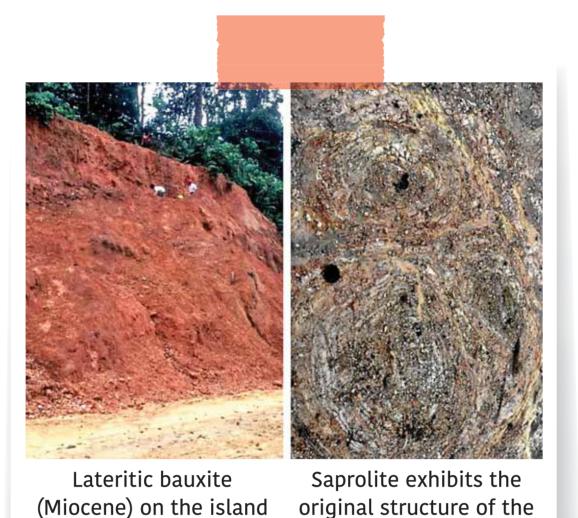
Classification

Lateritic bauxites

(88% of all bauxites) are associated with weathering crusts on the surface of silicate rocks in a variety of paleogeographic settings. They are developed preferentially on flat-topped plateaus and occur on large continental-scale planation surfaces exposed to humid tropical to subtropical monsoon climate, whereby optimal hydraulic conditions are controlled by the balance between precipitation and evaporation. Lateritic bauxites are spread over large provinces such as Australia, the Caribbean, the Guyana and Brazilian shields in South America, as well as the Guinea Shield and Cameroon in West Africa.

Karst bauxites

(12% of all bauxites) occur as more or less continuous, mainly redeposited, soillike blankets covering the karstified surface of (mainly shallow marine) carbonate rocks, which behaved as both a physical and chemical trap. The karstic network provided optimum drainage, necessary for further desilicifications, as well as providing a protected environment from later surface erosion. Karst bauxite deposits preferentially occur in Europe and Jamaica. In Europe the "bauxite belt" is striking from the Hellenides to the Dinarides and to some extent in the Pannonian realm and in the Northern Calcareous Alps. In some isolated karst terrains, bauxites may have formed exclusively from the insoluble residue of carbonate rocks, but it most commonly comprises a variety of external materials, including aeolian dust, volcanic debris and clastic sedimentary particles that were carried to the carbonate terrain by various transport mechanisms.



original structure of the parent material



Origin of karst bauxites: (par)autochthonous (high-level karst; in situ processes predominate, vadose lithofacies)

unconformity on the island of Jamaica.

parallochthonous (sloping terrain; transitional) allochthonous (low-level karst;

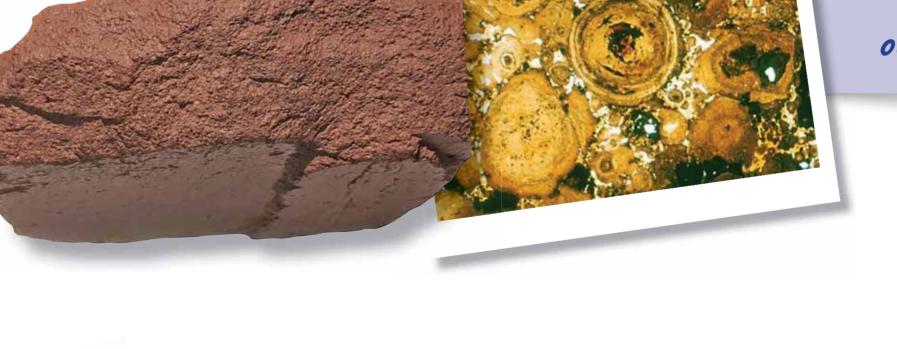
resedimentation, phreatic lithofacies)

Typically textures of karst bauxites:











Jurassic clayey bauxites occur at numerous localities in Istria.

Bauxite deposit Vrace (Lika)



Bauxite mine "Minjera" near Sovinjak

Bauxite deposit Bralići (Istria)

Bauxite deposit Rovinj (Istria)

Triassic deposits are considered to have formed by bauxitic processes in situ during emersion between Ladinian and Carnian age, which was related to the beginning of the Alpine orogeny. They are found in the Slunj area and Lika.

Mining, Metallurgy and Industry

Bauxite is the principal ore of aluminium and an important industrial mineral

Approximately 75% of all bauxites mined is used to produce aluminium metal by a two-stage process:

1) refining of bauxite to alumina by the Bayer process (a wet chemical caustic leach)

2) electrolytic reduction of alumina to aluminium metal by the Hall-Heroult process.

Gibbsitic bauxite are preferred over boehmitic bauxite and especially diasporic bauxite as it has lower energy requirements during Bayer process. When operating the Bayer process, highly alkaline waste (pH 10 - 13) known as red mud (up to 60% of iron oxides; silica; unleached residual aluminium and titanium oxide) is generated.

Bauxite is also world's main source of gallium. 25% of the bauxite is utilized as industrial mineral (chemical industry, cements, abrasives, proppants).

Bauxite has also been considered as a possible viable source of rare earth elements/ critical metals (REE/CRM) for a long time.

Production and reserves

More than 160 million metric tons of bauxite are mined each year. The majority of currently operating bauxite mines contain reserves in the range from 10 to 1000Mt dry bauxite whereby ore grades vary between 40 and 55 wt.% available Al₂O₃. The leaders in bauxite production include Guinea, Australia, Vietnam, Brazil and Jamaica. For some bauxite producing countries such as Jamaica, Guyana, Guinea, and Suriname the potential bauxite value contributes to 10% and more of the countrie's GDP.

Aluminium

- · most abundant metallic element in the Earth's crust · most widely used metal after iron
- usually alloyed with copper, zinc, magnesium, manganese, or silicon to improve its mechanical properties, especially when

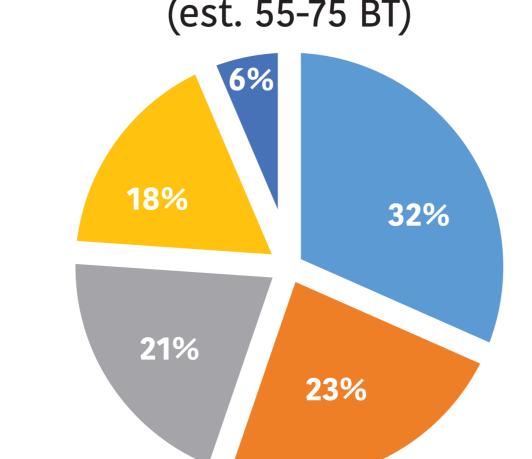
Africa

Asia

elsewhere

- · 100 percent recyclable and highly durable
- · nearly 75% of all aluminium ever produced is still in use today
- · recycling aluminium saves more than 90% of the energy needed to create a comparable amount of the metal from raw material

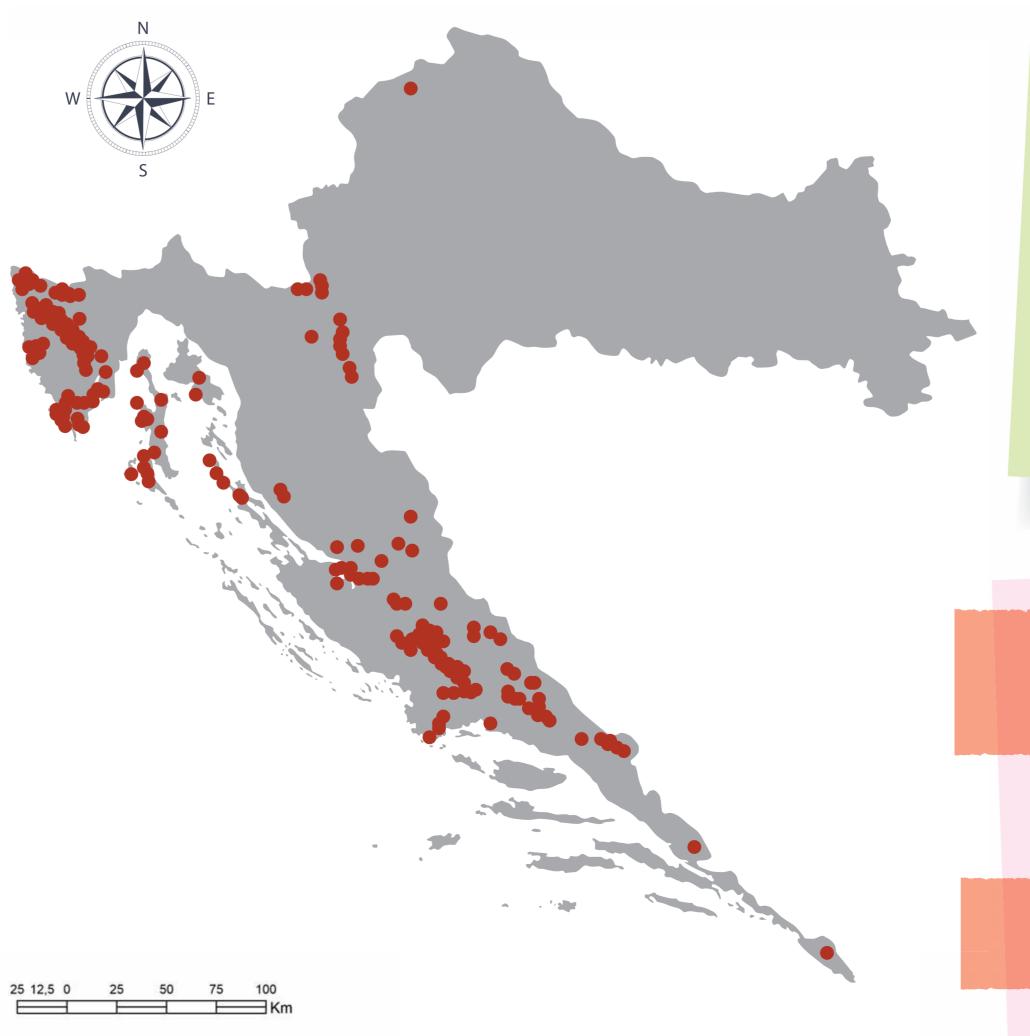
World bauxite resources in 2019 (est. 55-75 BT)



South America and the Caribbean

- Oceania
- Aluminium usage 36%
 - automobiles and airplanes botling and canning industries building and electrical

other aplications



Other names for bauxites used in the present-day Croatia: · Pyrite Aluminoso -Vetriolica - named by Pietro Turini in 1780

- used as name for bauxite from "Minjera" mine near Sovinjak in Istria · Cliachite

- named by German mineralogist August Breithaupt in 1847 - after the Kljaka bauxite deposit near Drniš

Interesting facts: Interesting.

- The oldest bauxite mine

- The oldest bauxite mine
in Europe is "Minjera" near
in Europe is "Minjera" near
Sovinjak in Istria (mining
Sovinjak in Istria (mining started in 1560s) - The deepest bauxite mine in the world in time of its in the world in 1963) was Kalun closure (in 1963) was Kalun near Drniš in Dalmatia

Mining for aluminium industry, cements, abrasives, and bricks

eit

RawMaterials

Upper Paleogene bauxites were formed during emersion

caused by Pyrenean orogenic phase in Middle Eocene and

were accumulated in the paleorelief of Upper Cretaceous and

Lower Paleogene limestones, more rarely Kozina deposits. They

are overlaid by transgressive Promina sediments, which were

deposited during Middle and Upper Eocene as well as Lower

Oligocene. They are found in the area of Obrovac, Drniš, Sinj

and Imotski in Dalmatia.

Creataceous clayey bauxites (Early and Late Cretaceous)

sporadically occur in Istria, along Northern Adriatic islands

and Svilaja and Dinara mountains (Early Cretaceous

bauxites) and in the area of Karlovac County

(Late Cretaceous bauxites).

REEBAUX

from Middle Triassic to Miocene. They vary in their origin, age, size, and economical importance.

Bauxite deposit Mamutovac near Drniš (Dalmatia)

The area of the Croatian Karst (External or Outer) Dinarides is a thick carbonate succession deposited from the Middle Permian

(or even Upper Carboniferous) to the Eocene on platforms of different ages, type and palaeogeographical setting. The models of

the orogenic evolution of the Adriatic (Adriatic-Dinaric) Carbonate Platform (AdCP) with special reference to External Dinarides of

the NE Adriatic region underlined the importance of numerous hiatuses (regional unconformities) of variable duration marked by

Bauxite deposits, hosted in carbonate rocks, are widespread and confirmed at numerous locations, in ten stratigraphic horizons

Bauxites in Croatia

Neogene bauxite deposits are found in Karlovac County (Tounj) and

Lower Paleogene bauxites were deposited after

Laramian movements on paleorelief developed on

the Upper Cretaceous limestones. They are found

at numerous localities in Istria, along Northern

Adriatic islands and in Dalmatia.

Bauxite deposit near Kijevo (Dalmatia).

Dalmatia (Peruča, Trilj).

Bauxite deposit Obrovac

bauxitic deposits.

- · continuous mining for aluminium in period 1914 1990
- more than 1000 bauxite deposits were mined
- · roughly 27.5 million tonnes of bauxite had been recovered
- · over 800 open pits left (many are used as illegal waste disposal sites)
- · "Rovinj" in Istria is only active deposit (for cement industry)
- · potentially contain significant concentrations of rare earth elements/critical

metals (REE/CRM)