

12th International Marble and Natural Stone Congress 2025

Afyonkarahisar, Türkiye

FIELD TRIP GUIDE

Saturday, 25 October 2025



1. GEOLOGICAL AND GEODYNAMIC EVOLUTION OF MARBLE QUARRIES LOCATED IN THE CENTRAL PART OF THE İSCEHİSAR REGION

1.1 Historical Evolution of İscehisar Marbles

Marbles from the İscehisar area—historically referred to as Dokimeion—have played a prominent role from ancient times through to the modern era.

- Archaeological evidence suggests that marble production in the İscehisar region began around 900 B.C., marking nearly three millennia of quarrying activity.
- During the Roman era, between 30 B.C. and A.D. 395, Afyonkarahisar served as an important marble industry center. The marbles extracted from Dokimeion were distributed through Synnada (today's Şuhut) and became widely known as "Synnada Marble," either in semi-worked form or as unprocessed blocks.
- Evidence from ancient cities, where roads and monuments were built predominantly of marble, reveals that the region possessed a considerable capacity for marble production and that the material was commonly utilized in antiquity.

During this time, marble production in the area was elevated from a local activity to an enterprise of imperial significance, providing essential building materials across the Roman world.

During the Ottoman period and up until the establishment of the Republic, marble production lost its significance due to limited technological means and the relatively low commercial value of marble. However, marble production, which regained importance in the 20th century and thereafter, began to recover its commercial value particularly after 1980 with the help of technological advancements. At the beginning of the 2000s, it is known that a relatively small number of marble quarries were operating in the region, with a production volume of approximately 172 m³. Currently, İscehisar marbles achieve a production volume of around 500,000 tons and are exported and used across numerous international markets. Marble exports in 2024 amounted to around 230 million USD, marking a 15% rise relative to the preceding year. Accounting for roughly 10% of Turkey's total exports, these numbers underscore the critical importance of marble production for both Afyonkarahisar Province and the nation.

1.2 Geology and Litostratigraphy

Approximately 25 km northeast of Afyonkarahisar, the İscehisar Marble Region forms a prominent area for marble extraction in the province. Stratigraphically, the İscehisar Region consists of, from the base upward, the Doğanlar Schists, an Upper Permian–Lower Triassic Conglomerate unit, Triassic–Jurassic carbonates, Neogene volcanic and pyroclastic rocks, and Quaternary alluvial deposits (Metin et al., 1987; Tolluoğlu et al., 1997; Kibici et al., 2001; Dereli et al., 2010; Başaran et al., 2019). Mineralogically, the Doğanlar Schist consists of albite, chlorite, epidote, amphibole, muscovite, biotite, and quartz. İscehisar Marbles occur in the form of two lens-shaped bodies within low-grade metamorphic rocks such as Paleozoic micaschist, phyllite, and quartzite. Of these lens-shaped bodies, the larger one covers an area of approximately 5 km², while the smaller one occupies around 1 km². The thickness of these lenses ranges from 50 to 250 meters. The types of İscehisar Marbles have been named Afyon Sugar, Afyon White, Afyon Tigerskin, Afyon Grey, and Afyon Violet (Bağcı et al., 2014).

1.3 Geodynamic Evolution

İscehisar marbles, found in Afyonkarahisar Province, are part of the Western Anatolian section of the Alp-Himalaya tectonic belt. During the Neotectonic period, Afyonkarahisar and its surroundings were subjected to extensive crustal deformation. Under the influence of tectonic forces, the İscehisar Region initially underwent a compression phase, followed by an extension phase. Examining the geodynamic stages of the İscehisar Marbles, during the Paleozoic period, limestones were formed through calcium and carbonate precipitation in a marine environment. The limestones were subjected to regional metamorphism, resulting in recrystallization and the development of marbles. Following tectonic processes, the marbles were deformed into two lens-like structures, known as the large and small marble lenses. These marble lenses reached the surface as a result of tectonic movements and erosional effects (Bağcı et al., 2017). Currently, the region is under the influence of Western Anatolian extension, with north–south oriented opening movements observed. Under this extensional regime, fracture formations occur (Emre & Duman, 2011).

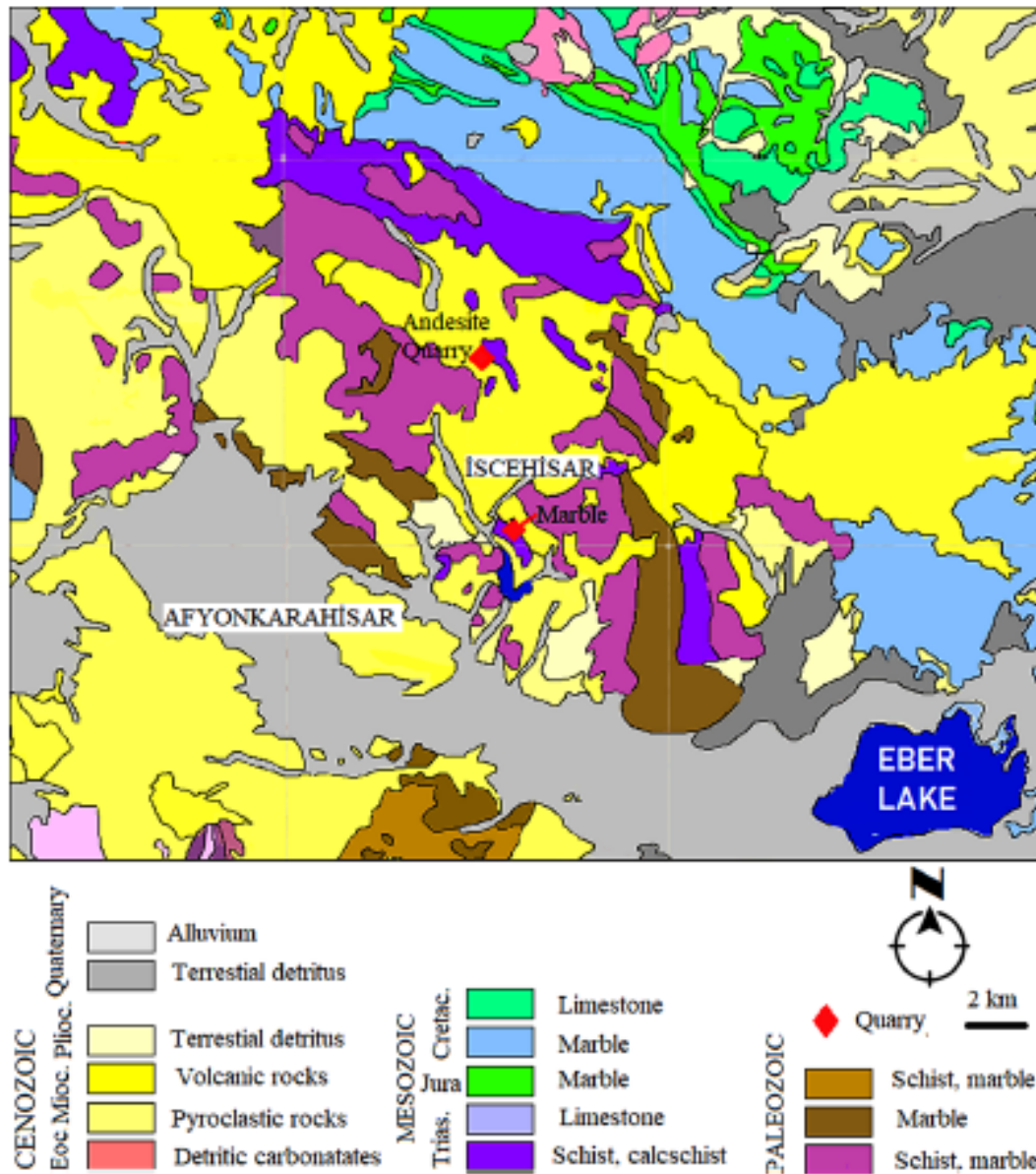


Figure 1. General geological mapping of the area, based on MTA (2023).

2. İSCEHİSAR REGIONAL MARBLE TYPES

İscehisar marbles in Afyonkarahisar Province may be divided into three principal types: calcitic, dolomitic, and transitional zone marbles.

2.1 Calcitic Marbles

In the top section of the İscehisar marble sequence, calcite is present in significant quantities. These types of marbles are represented by homogenous crystalline marbles with a low dolomite content (Bağcı et al., 2017). Electron microscope analyses show that these marbles generally exhibit a granoblastic texture, with grain sizes predominantly ranging from 0.2 to 1.5 mm in diameter. Studies indicate that the calcitic marbles have undergone intermediate-grade regional metamorphism. Small amounts of quartz, mica,

chlorite, and sericite are observed, and calcitic marbles have been determined to include about 55% CaO and 0.5% MgO. These marbles are in high demand due to their low water absorption (<0.2) and high strength (100–120 MPa). Calcitic marbles are commercially known under three different trade names: Afyon White, Afyon Sugar, and Afyon Violet. Afyon Beyaz marble, also known in antiquity as Dokimeion White Marble, is predominantly composed of calcite (>95%) and presents a vivid white coloration. Afyon Sugar marble generally appears in white tones, although greyish shades may be observed in some areas. This marble type, exhibiting a granoblastic texture, possesses high strength properties. The Afyon Menekşe marble displays light purple veining on a white background. These veins originate from iron oxide and manganese minerals, providing a visually striking appearance.

2.2 Transitional Zone Marbles

Transitional zone marbles are located between the calcitic and dolomitic zones and exhibit mineralogical characteristics of both zones. These marbles, composed of both calcite and dolomite, display heterogeneity in color and texture (Bağcı et al., 2014). Under polarized light microscopy, these marbles are observed to have a mosaic texture with heteroblastic microstructure. This marble contains about 50% CaO and roughly 5% MgO, with minor concentrations of Fe, Mn, and Sr. Commercially, they are known under the trade names Afyon Bone, Afyon Cherry, and Afyon Green. Afyon Bone marble exhibits a light beige to ivory color and is characterized by thin veining. Afyon Yeşil marble presents greenish hues and occurs infrequently, while Afyon Kiraz is rich in Fe and Mn and shows a red coloration.

2.3 Dolomitic Marbles

Dolomitic marble is located at the bottom or peripheral parts of the İscehisar marble sequence. This marble type, mainly composed of $\text{CaMg}(\text{CO}_3)_2$, contains less than 10% calcite (Bağcı et al., 2014). Polarized microscope analyses show that the minerals exhibiting a heteroblastic texture have grain sizes ranging from 0.5 to 3 mm. In this marble type, CaO constitutes 30–40%, and MgO comprises 15–20%. According to isotopic studies, the marbles underwent recrystallization under high-temperature conditions (300–450 °C) (Çelik & Sabah, 2008). These dolomitic marbles are marketed under the names Afyon Pink, Afyon Brown, and Afyon Tiger Eye. Afyon Pink marble has a high dolomite content and contains minor amounts of Fe. The Fe content contributes to the coloration of this marble type. This marble type, Afyon Brown, displays brown-beige hues and demonstrates significant strength. Afyon Kaplan Gözü exhibits brown and yellow stripes throughout its structure.

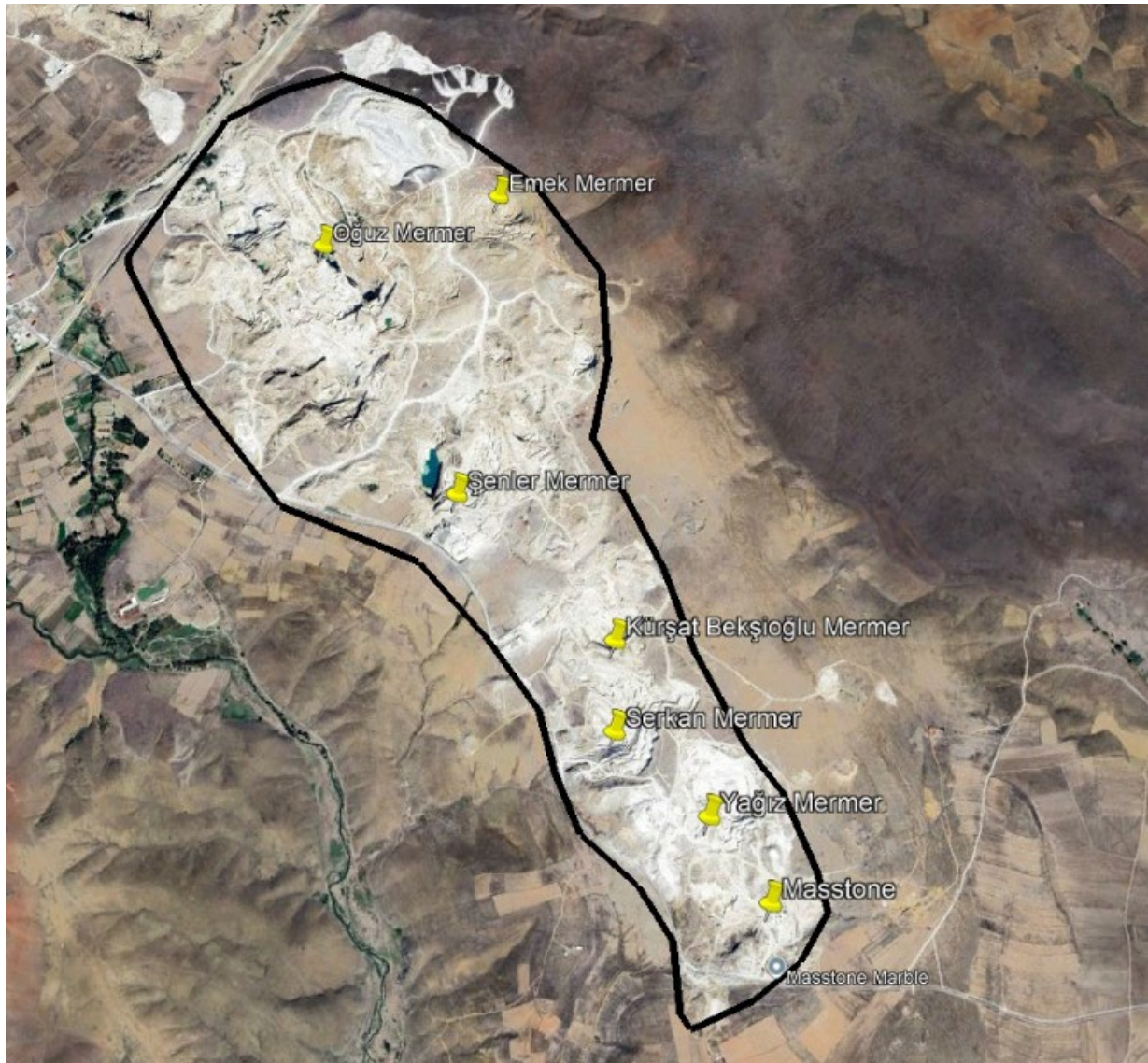


Figure 2. Marble quarries within the large lens of İscehisar as seen in Google Earth imagery.

3. PHYSICOMECHANICAL AND CHEMICAL PROPERTIES of İSCEHİSAR REGION MARBLES

3.1 Calcitic Marbles

Calcitic marbles contain approximately 55% CaO and 0.5% MgO. Tables 1 and 2 present the physicomechanical and chemical properties of this marble type.

Table 1. Physicomechanic properties of calcitic marbles.

Unit	Value
Unit Weight (g/cm ³)	2,69-2,75
Porosity (%)	0,3-0,7

Water Absorption (%)	0,07-0,25
Compressive Strength (MPa)	100-120 MPa
Flexural Strength (MPa)	13-18
Poisson's Ratio	0,22-0,28
Elastic Modulus	55-65

Table 2. Chemical properties of calcitic marbles

Component	Average Value (%)
CaO	55,2
Bound CO ₂	43,8
MgO	0,35
SiO ₂	0,25
Al ₂ O ₃	0,10
Fe ₂ O ₃	0,12
Na ₂ O	0,03
K ₂ O	0,02
Loss on Ignition	43

3.2 Transitional Marbles

Transitional zone marbles, combining characteristics of calcitic and dolomitic varieties, contain about 50% CaO and 5% MgO; Tables 3 and 4 summarize their physicommechanical and chemical data.

Table 3. Physicommechanical properties of transitional zone marbles

Unit	Value
Unit Weight (g/cm ³)	2,75-2,82
Porosity (%)	0,6-1,1
Water Absorption (%)	0,15-0,35
Compressive Strength (MPa)	80-115
Flexural Strength (MPa)	11-16
Poisson's Ratio	0,24-0,30
Elastic Modulus	50-60

Table 4. Chemical properties of transitional marbles

Components	Average Value (%)
CaO	50
Bound CO ₂	43,5
MgO	0,5

SiO ₂	0,40
Al ₂ O ₃	0,15
Fe ₂ O ₃	0,25
Na ₂ O	0,04
K ₂ O	0,03
Loss on Ignition	42,8

3.3 Dolomitic Marbles

Dolomitic marble contains less than 10% calcite, with CaO between 30–40% and MgO around 15–20%. Its physicommechanical and chemical characteristics are shown in Tables 5 and 6.

Table 5. Physicommechanical properties of dolomitic marbles

Unit	Value
Unit Weight (g/cm ³)	2,83-2,89
Porosity (%)	0,8-1,4
Water Absorption (%)	0,20-0,40
Compressive Strength (MPa)	75-105
Flexural Strength (MPa)	9-14
Poisson's Ratio	0,25-0,32
Elastic Modulus	45-55

Table 6. Chemical properties of dolomitic marbles

Components	Average Value (%)
CaO	35
Bound CO ₂	47,5
MgO	17,5
SiO ₂	0,50
Al ₂ O ₃	0,20
Fe ₂ O ₃	0,30
Na ₂ O	0,05
K ₂ O	0,04
Loss on Ignition	47



SUPPORTING ORGANIZATIONS



Afyonkarahisar Sanayicileri ve İş Adamları Derneği



SPONSORS



4. KAYNAKLAR

Bağcı, M., Kozak, M., Yıldız, A., & Başaran, C. (2017, Nisan 10–14). İscehisar Boğaz Mevkii (Afyonkarahisar) mermerlerinin mineralojik-petrografik ve jeokimyasal özellikleri. 70. Türkiye Jeoloji Kurultayı Bildiriler Kitabı, 154–155.

Bağcı, M., Yıldız, A., & Başaran, C. (2014). İscehisar mermer ocak ve fabrikalarda oluşan artıkların agrega olarak kullanılmasının araştırılması. *Yapı Teknolojileri Elektronik Dergisi*, 10(1), 7–14.

Başaran, C. (2006). İscehisar'ın (Afyonkarahisar) jeolojisi ve mermerlerin fizikomekanik özelliklerinin incelenmesi [Bitirme tezi, Süleyman Demirel Üniversitesi, Mühendislik-Mimarlık Fakültesi, Jeoloji Mühendisliği Bölümü]. Isparta.

Başaran, C., Yıldız, A., & Cığerci, Ş. M. (2019). İscehisar (Afyonkarahisar) termal ve mineralli sularının hidrojeokimyası ve kullanım özellikleri. *Jeoloji Mühendisliği Dergisi / Journal of Geological Engineering*, 43, 279–292. <https://doi.org/10.24232/jmd.655363>

Emre, Ö., Duman, T. Y., Doğan, A., & Özalp, S. (2011a). 1:250.000 ölçekli Türkiye diri fay haritası serisi. Maden Tetkik ve Arama Genel Müdürlüğü Yayını.

Kibici, Y., Yıldız, A., & Bağcı, M. (2001b). Afyon kuzeyinin jeolojisi, mermer potansiyelinin araştırılması. In *Türkiye III. Mermer Sempozyumu (MERSEM-2001)* (pp. 73–84). Afyon.

Metin, S., Genç, Ş., & Bulut, V. (1987). Afyon ve yakın dolayının jeolojisi (MTA Rapor No. 8103). Maden Tetkik ve Arama Genel Müdürlüğü, Ankara.

Sümer, Ö. E., Tolluoğlu, Ü., & Erkan, Y. (1997). Türkiye II. Mermer Sempozyumu bildiriler kitabı. Türkiye II. Mermer Sempozyumu, 35–41.

Yavuz Çelik, M., & Sabah, E. (2008). Geological and technical characterisation of Iscehisar (Afyon–Turkey) marble deposits and the impact of marble waste on environmental pollution. *Journal of Environmental Management*, 87(1), 106–116. <https://doi.org/10.1016/j.jenvman.2007.01.004>

<https://data.tuik.gov.tr/Kategori/GetKategori?p=dis-ticaret-104>