# IN-SITU KAOLINITIC RAW MATERIALS WITHIN THE QUARTZ-SERICITE / MUSCOVITE SCHISTS OF DOĞANHISAR (KONYA, CENTRAL TURKEY): ITS MINERALOGIC AND TECHNOLOGICAL CHARACTERISTICS WITH THE POSSIBLE USE IN CERAMIC TILE INDUSTRY

**Kağan Kayacı[a], Ş. Can Genç[a,b], Yıldız Yıldırım[a], Aykut Keskin[a]**

**[a.] Kaleseramik Research-Development Center, Çan, Çanakkale, Turkey.**

**[b.] Istanbul Technical University, Dept. of Geological Engineering, Maslak, Istanbul, Turkey.**

## ABSTRACT

The in-situ kaolinitic clay occurrence of the Doğanhisar region is in the quartz sericite-muscovite schists/phyllites and quartzites of the late Devonian aged Engilli formation of the Sultandağı unit. These rocks are white colored, similar to talc, and very soft in nature. Geological data revealed that these rocks were formed by the hydrothermal alteration of metamorphic rocks. The raw materials were characterized

petrographically (optical microscopy), mineralogically (X-ray diffraction) and chemically (XRF).

Firing and some technological tests were carried out on the Doğanhisar kaolinitic quartz sericite-muscovite schists. These data indicate that this raw material can be used as whitener of dark-colored bodies in ceramic wall and floor tile production. Besides, it was found that the Doğanhisar kaolinitic quartz sericite-muscovite schists/phyllites are suitable and can be used in different proportions for conventional wall and floor, and porcelain tile productions.

## 1. INTRODUCTION and RESULTS

Sericite belongs to the mica group of minerals and is fine-grained white mica. The name "sericite" comes from Greek for "silky". It is similar generally to muscovite and sedimentary illite in terms of chemical composition. Sericite is used in different industries, such as ceramic wall and floor tile, tableware, and sanitaryware manufacturing, paints, cosmetics, rubber industry, as a fluxing agent in welding rods and reinforcement in plastics and as fillers for whitewares. Significant sericite occurrences are found in Malaysia, Korea, China, Japan, India, Russia, Taiwan, USA and Vietnam (USGS, 2010). There is no record of the Doğanhisar sericites in literature. Therefore, this paper is a pioneer study on Turkish sericites. The in-situ clay occurrence of the Konya-Doğanhisar region (Fig 1a, b) is in the quartz sericite schists/phyllites and quartzites of the late Devonian aged Engilli formation (Haude, 1968; Özgül et al, 1991, Aksoy et al, 2008) of the Sultandağı unit. Doğanhisar sericites are white colored and very soft in nature. It displays a silky luster similar to talc (Fig1b). Geological and petrographical studies revealed that these rocks were formed by the hydrothermal alteration of pelitic metamorphic rocks.

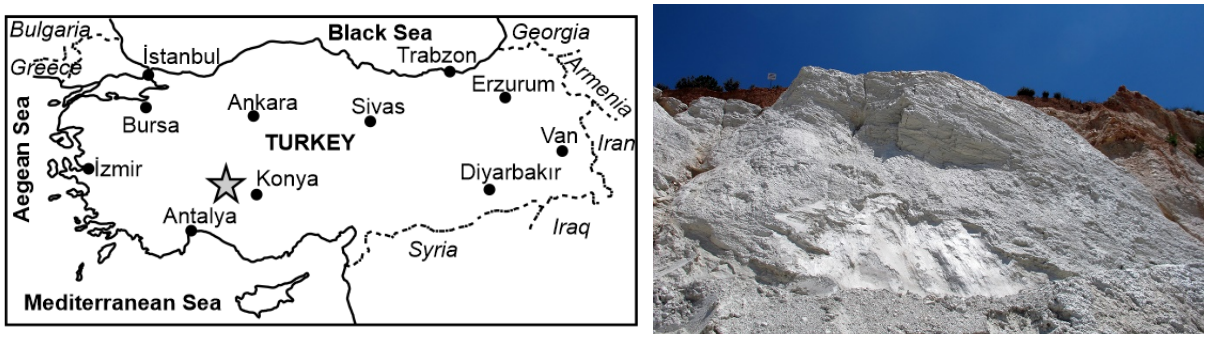


***Figure 1a, b.*** *Location (gray star) map and general outcrop view of the Doğanhisar sericites.*

Petrographic studies show that they have perfectly slaty foliation together with the fine grains of quartz and sericite/muscovite. XRD analysis indicates it is formed from quartz (40%), muscovite/sericite (39%), kaolinite (19%), rutile (1%) and feldspars (1%) paragenesis.

Doğanhisar sericites were fired under 1130 and 1185°C conditions, and then color, firing shrinkage and water absorption values were obtained. Then different body formulations (QS-10 to QS-40) were composed using varying amounts of sericite. Fired recipes were investigated in terms of XRD and physical aspects such as water absorption, linear firing shrinkage and mechanical strength (Table 1).

| Composition | Firing shrinkage (%) | Water absorption (%) | Dry strength (N/mm²) | Color | | |
|---|---|---|---|---|---|---|
| | | | | L | a | b |
| STD | 7.53 | 0.00 | 5.0 | 47.83 | 5.35 | 13.71 |
| QS-10 | 7.17 | 0.00 | 4.0 | 48.7 | 5.28 | 13.97 |
| QS-20 | 7.31 | 0.00 | 3.7 | 50.78 | 4.98 | 15.14 |
| QS-30 | 7.75 | 0.00 | 2.7 | 52.68 | 4.87 | 15.54 |
| QS-40 | 8.27 | 1.32 | 1.5 | 54.41 | 5.23 | 16.54 |

***Table 1.*** *Firing behavior of the porcelain tile compositions prepared with Quartz-Sericite Schist (Max sintering temperature: 1180°C; furnace cycle: 46 min.)*

In this study, the mineralogical, chemical and technological features of the Doğanhisar sericites were investigated. In the light of the obtained data and findings, this raw material was found to be suitable for ceramic manufacturing. Due to its very high white color it can be used as whitener of dark-colored bodies in ceramic wall and floor tile production.

## 2. REFERENCES

[1] Aksoy, R., Bozdağ, A., 2008. S.Ü. Müh.-Mim. Fak. Derg., 23: 2, 37-45.

[2] Haude, H., 1968. Münster, PhD Thesis, Münster, 146 pp.

[3] Özgül, N., Bölükbaşı, S., Alkan, H., Öztaş, Y., Korucu, M., 1991. Türkiye Petrolleri Anonim Ortaklığı Raporu, Rapor No: 3028, Ankara.

[4] USGS, 2010. Minerals yearbook: Metals and Minerals, Vol.1.