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Determining buried grid street system and native of the remains with GPR and petrography, in ancient Nysa city, Aydin - Turkey

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Nysa, is one of the most important ancient cities of the region of Caria in Anatolia (Asia Minor), was built on the slopes on the sides of the stream called Tekkecik, in a 3 km North of Sultanhisar, East of Aydın city of Turkey. The buildings, streets and public squares of the ancient city were supported by vaulted substructures adapted to the topographic conditions. There are important ruins on the site from the Hellenistic and the Roman periods and the Byzantine era. Now the Greek theatre and its walled entrance are intact. Other important remains are the gymnasium, stadium, library, temple, nymphaeum, bridge a tunnel like structure and the Byzantine churches in the West; the agora, Bouleuterion / Gerontikon, and the Roman public baths in the East.

The first aim of the study was to determine the locations of the buried streets thought grid system according to the some excavated results already in the east and west side of the Nysa. Therefore the GPR studies were realized selected areas, which could include the streets, around the Bouleuterion / Gerontikon and at the South of the library. Two dimensional (2D) GPR data were measured on the parallel GPR profiles spaced 1m apart on each part of the study areas using 250 MHz shielded antennas. The processed parallel profile data set was formed through a solid 3D view by aligning the profiles respectively. A simplified amplitude-color range and appropriate opacity function were constructed to activate buried remains. Interactive interpretation was done with time slices and transparent sub-blocks of the 3D volume by arranging an opaque function. It was known that the maximum amplitudes represented the remains. So, weak amplitude range around the zero amplitude was eliminated by giving zero opacity value and transparent 3D imaging was obtained. The second known was that the amplitudes were decreased according to time. Therefore, amplitude scale could be weighted by a constant coefficient changing with the time range of the 3D sub-volumes, which was bigger than one and smaller than two and had a decimal number. As a result, all remains could be imaged in the transparent 3D depth-volumes where the street could be revealed clearly. Finally three streets were revealed in the depth volumes. The first street was on the West part and the second street, which was parallel of the first street, was on the Southwest part of the Bouleuterion / Gerontikon and the third street was on the South of the library. Diggings on the West and Southwest parts of the research area encouraged the 3D image results.

The second aim of the study was to find out native rocks of the Nysa remains and sources. The small rock samples were collected from the theatre, stadium, basement of agora and the tomb and analyzed under polarized microscope and confocal Raman spectroscopy. The results of the studies revealed that the main rocks of these remains composed of white color marble. These marbles have granoblastic texture composed of mainly pressure twinned calcite as coarse grain size under the polarized microscope. The confocal Raman spectroscopical studies revealed that the marble remains of Nysa ancient city were mainly built from Jurassic- Cretaceous carbonate rocks of Western Anatolia marble quarry in the vicinity region.
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