



The building stones of the Khmer-temple at Angkor/Cambodia: A petrological and geochemical approach towards a conservation oriented characterisation of the inventory.

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The Angkor Park /Cambodia, as a prominent member of the Unesco world heritage, is one of the outstanding cultural relics on earth. Countless Khmer temples were successively built between 9th -13th century. More and more of these monuments become accessible to conservators and scientists as well as to visitors and it becomes obvious that many of them are highly endangered. The German Apsara Conservation Project (GACP) is engaged in stone conservation interventions at different tempels in Angkor since more than 10 years.

During the preparation of interventions in individual temples the building stones were investigated concerning their most important properties in regard to conservation strategies (Leisen et al. 1996, 2004). It turned out that there are considerable differences in weathering behaviour between the sandstones used at different temples and that the composition and texture of the building stones are determining factors for the degree and the type of decay. The study presented aims at a detailed geochemical and mineralogical characterisation of the building stones starting with samples from some of the most prominent temples. Together with petrophysical data this shall provide a material oriented database for future conservation conceptions.

As a first step six temples, Preah Ko (9th century), Pre Rup (10th century), Banteay Srei (10th century), Ta Keo (10th century), Angkor Wat (12th century) and temple Bayon (12th/13th century), and two quarries were sampled for investigations fo-

cusssing on variability during distinct building periods within single temples, criteria for distinguishing between materials from different temples and periods and a correlation with samples from two quarries.

The material was characterised petrographically by optical microscopy, the components were analysed by electron microprobe and whole rock chemistry of main and some trace elements that were determined by XRF-analysis. X-ray diffraction was used for determining clay minerals in selected rocks.

On a petrographic base most of the rocks can be classified as feldspathic greywackes (according to Pettijohn et al. 1972), in one, the Banteay Srei temple, lithic greywackes were found. In spite of this similarity the rocks display a distinct variability in regard to their chemical composition and texture. Modal variations and heavy mineral analysis are not sufficient for a characterisation of the material, but the combination of different methods allows to point out some correlations between the different temples. The combinations of the modal variations with the XRF-analysis or with the results of the electron microprobe show clear correspondences in the observed variability of the temples building stones. On the other hand the building stones from the Ta Keo (feldspathic greywackes) and the Banteay Srei temple (lithic greywackes) are distinctly different from the others. They also show no correlation with the samples of the ancient quarries.

Future investigations extend to temples (also smaller ones) and ancient quarries in the wider surrounding of the Angkor Park aiming at the set-up of a database on the variability and historical variations in the building stones used during the five centuries of construction.

References

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