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The effect of lamination in Triassic sandstones on their Knoop hardness and longitudinal ultrasonic wave velocity

Abstract

The paper presents the results of laboratory research on Triassic sandstones from the Permian-Mesozoic rim of the Świętokrzyskie Mountains. The samples represented the Zagnańsk Formation (lower Buntsandstein) that is mainly of aeolian origin, and the Baranów Formation (upper Buntsandstein) sedimented mostly in a shallow sea and partially is an alluvial deposit. The characteristic feature of these rocks is lamination which is macroscopically observable as a colour variation from light pink to dark red, and underlined by changes of their grain size. Petrographic microscopic investigation was used to determine volumetric content of different types of laminas and subsequently the various mineralogical composition of the cement. Ultrasonic wave velocity in both the dry and water saturated samples was measured in directions perpendicular and parallel to the lamination. Unprecedentedly for these types of rock the Knoop hardness was tested on mineralogical components of the all laminas types. The authors demonstrated that the sound wave velocity depends not only, as it is widely accepted, on the porosity, moisture content and the direction, but also strongly relates to the hardness of the individual laminas.