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Common Features of Deformation Behavior Between Human Tooth Enamel and Rocks

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Abstract. The contribution of bioorganic components in the deformation behavior of a rock-like biocomposite human tooth enamel is discussed. Uniaxial compression testing and Brazilian testing (diametral compression) in liquid nitrogen (77 K) and in air at room temperature were carried out on the samples cut from human tooth enamel. It was compared with deformation behavior of some rocks (granite, serpentinite, and jasper) and plasma-sprayed Al_2O_3 under compression and Brazilian testing in air at room temperature. It was shown that enamel and the rocks exhibit the viscoelastic-like deformation behavior under compression, whereas their macroscopic response becomes brittle under tensile stress. Fracture surface morphology was attested as brittle in all model materials, although cracks in them all advance by the viscoelastic-like manner as a crack in a ductile metal. The contribution of viscoelastic bioorganic component in deformation behavior of enamel is detected at room temperature only because bioorganic component leaves the viscoelasticity at low temperatures. However, this contribution does not lead to changing the character of deformation behavior of the rock-like biocomposite in comparison with these rocks.

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