

## عنوان مقاله:

Experimental Assessment of Damage and Crack Propagation Mechanism in Heterogeneous Rocks

## محل انتشار:

پنجمین کنفرانس بین المللی پژوهش های کاربردی در علوم و مهندسی (سال: 1399)

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## خلاصه مقاله:

Many significant projects, such as tunnel boring, trench and slope stabilization, underground mining and reservoirs, and dam design, rocks are subject to a variety of stress levels, which may lead to cracks creation, extension, and eventually rocks failure. Investigating this issue becomes more complicated when the rock structure is inherently heterogeneous. Indeed the heterogeneity can participate in the creation of stress concentration in sensitive zones and generally alter the damage process. This research aimed to investigate the heterogeneous effect on crack growth and damage propagation. Various methods have been developed to expound the damage and failure process of brittle materials. Recently, among these methods, the study of transient wave velocity has attracted more attention in the damage mechanics field, due to its unique characteristics. In this research, in addition to investigating the effects of crack and damage growth on wave velocity, other methods such as petrography and computed tomography (CT) scan imaging have been used for accurate evaluation. For this purpose, travertine specimens as a heterogeneous porous and marble specimens with pre-exciting flaws and cracks have been loaded on several levels, and the effects of crack initiation and growth on wave velocity are investigated. Also, thin-sections have been prepared to examine the microstructure of the samples, and the effect of loading was studied on a microscopic scale. The results showed that the damage threshold in marble and travertine samples was 45% and 55% of failure load, respectively. Also, at the initial loading phase, which is accompanied by an increase in wave velocity, comparing the ratio of increasing wave velocity in marble specimens against travertine showed an increase of 36.75% in this zone. In the second phase, when the wave velocity decreases, these values were about close to each other before complete failure. Petrographic analysis can also confirm the results obtained from Ultrasonic devices about threshold and damage growth in specimens. Examination of the thin-sections also showed that the major cracks generally has grown around the pre-existing cavities and cracks due to the stress concentration. Nucleation and damage development in heterogeneous specimens always take place in the margins of these sensitive points by breaking the bonds between the grains or crushing the crystals

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