GTR Evolution V1 2 0 1 Crack __FULL__

With the increase in the number of experiments on the problem of swelling-cracking cracking and development of expansive rocks and the investigation of the generation and propagation law of initial cracks, the following conclusions were obtained: (1)Initial cracks are mainly distributed in the form of three-dimensional spiral multi-cracks; the initial cracks are more than the final cracks because the internal microcracks generated during the water swelling process may penetrate the surface and become visible as visible cracks; the size of the initial cracks is greater than that of the final cracks; in the present study, the initial cracks have penetrated the outside wall of the experimental box, and the cracking degree is

in the form of a vertical chord-like shape, as shown in Figure 24. And from the outside to the inside, the cracks continue to expand and the crack degree is getting larger. With the increase in the degree of cracks, cracks will develop from the outside to the inside, and the cracks will be a wrapped shape, as shown in Figure 24, and as a result, the wall between two adjacent cracks will be sheared, as shown in Figure 24 and Figure 25. Figure 25 shows the fracture of the expansion cracks. The cracks that have penetrated the experimental box wall are as follows: (i) cracks with a wrapped shape, (ii) large cracks, and (iii) small cracks. Figure 25(2)The swelling-cracking cracks of the expansive mudstone in the Central Sichuan red beds are mainly distributed in the form of three-dimensional spiral multi-cracks. The initial cracks are more than the final cracks because the internal microcracks generated during the water swelling process may penetrate the surface and become visible as visible cracks; the size of the initial cracks is greater than that of the final cracks.

According to the above analysis, the sample swells during the process of water absorption, and compressive stress concentration area appears in the middle part of the side (see Figure 21). Due to compressive stress concentration and water softening of the rock material, shear failure is very likely to occur in this area, and the crack will form a certain angle (rupture angle) with the side face. Under capillary action, water will migrate to the tip of the crack, causing the tip to absorb water and soften. At the same time, under the action of the principal tensile stress in the corner area, the crack will continue to expand along the vertical direction of the principal tensile stress until it penetrates the upper surface of the sample, forming a crack surface as shown in Figure 21. The main conclusions are as follows: (1)The phenomenon that the developed cracks develop rapidly with increased water content has been observed in numerous experiments and theoretical analyses in the past. However, this has not

been fully developed. This study makes a theoretical basis for the investigation of the initial crack and the development process of expansive rocks.(2)Most studies in the past mainly focused on the cracking of expansive rocks and hardly considered the impact of microstructure and numerical simulation on the development of cracks. This study comprehensively considered the influence of structural factors, including uneven swelling, the number of vertical cracks and the degree of microcracks, on the initial crack generation and development.(3)Most of the past studies mainly studied the water swelling cracks, and few studies focused on the results of swelling and cracking of expansive rocks. The development of engineering cracks should be based on the consistent analysis of the fracturing law of expansive rocks. This paper proposes a theoretical model for the development and evolution law of crack development of expansive rock caused by swelling(4)This paper studied the development characteristics and evolution characteristics of the cracks of expansive

rocks. It is found that the expansion law of expansive rock is divided into three periods: the generation stage, the rapid growth stage, and the stabilization stage. The final crack degree is related to initial water content, water absorption method, and clay mineral content. The water absorption, water absorption at the beginning of cracks and the water absorption when crack development reaches a stable level are three characteristic values of the water absorption. The water absorption at the beginning of cracks and the water absorption when crack development reaches a stable level are of great significance in engineering practice. They indicate that the development of cracks has entered a stage of rapid development, in which the crack degree increases exponentially with water absorption, and will provide the basis for the field tests on the cracking of rocks and artificial geological environment. 5ec8ef588b