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Infrared changes with the fracture and damage of the submarine soft rock

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Based on the submarine soft rock support engineering in Beizao Mine of Longkou Mining Corporation in China, the physical model tests of interaction of U-shape steel support and roadway were carried out. The thermal infrared (TIR) radiation with the fracture and damage of soft rock is investigated. Four kinds of structures are studied including roadway without support and without seawater, roadway with improved U-shape steel support and without seawater, roadway with actual U-shape steel support with seawater, and roadway with improved U-shape steel support and with seawater. It is discovered that the TIR radiation is the stronger in the location of stress concentration, strong friction and interaction range between U-shape steel support and tunnel than that in the location of stress relaxation and week friction. The TIR temperature (TIRT) of the large fracture increased higher and changed rapidly than other parts. Seawater influences the soft rockąś TIR radiation also. According to the order of the average TIRT increment before model failure, the sequence is high strength support, high strength support with water, without support and low strength with water. The TIR omens occur before peak load at the moment when load is 65%˜90% of the peak load. The overall TIRT of the model surface decreased rapidly when the tunnel damaged. The TIR radiation detection technology would be a prospecting new technology to monitor and forecast the safety of soft rock roadway.