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Numerical simulate for thermal stress distribution in heterogeneous rock and homogeneous fractured rock via application of microwave energy

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In order to analyze the characteristic of thermal stress distribution with the influence of Microwave irradiation in terms of rock under natural state, the numerical simulation technique was utilized in this paper. The new kind of rock failure model including heterogeneous and homogeneous fractured rock was proposed respectively. Then, the difference, especially about the deformation of fracture affected by stress and the distribution of thermal stress were compared between the traditional heating code and microwave irradiation.

The result shows that :1)microwave heating temperature field distribution is chiefly characterized by uneven [U+FF0C] the highest temperature zone emerges in the center and the lowest at the surface. However, which the traditional heating code shows is just on contrary. There is a closely relationship between the temperature and mineral dielectric constant for heterogeneous rock. And 2) the strains-stresses curve of homogeneous fracture rock is also different, the zone around the fracture is symbol of stress state rather than tension stress under the microwave irradiation code and the deformation is inward contraction compared with the traditional heating code .In fact, the pressure stress is much larger than the tensile stress. The width and depth of fracture will begin to shrink in microwave heating with the decrease of the distance between the fracture and heat source. That means that the closer to the fracture the pressure stress is more obvious.3) The heterogeneous stress distribution of rock is sensitive to the assimilation of microwaves for minerals, coefficient of thermal expansion and the relative spaces position among all the minerals. Traditionally, the direction of the stress will be different under difference constraint condition for that the characteristic of other surrounding minerals which restrict the minerals whose thermal expansion coefficient and dielectric loss factor is larger shows another trend of expansion. It also means that it is easy to expand with larger dielectric loss and coefficient of thermal expansion, but also affects by the mechanical property of other minerals around it.