

2. Developing Acid-Resistant Cementitious Support Materials for Mountain Tunnels - Rock Bolt Fixing Materials and Sprayed Concrete -

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Rock bolt fixing materials and sprayed concrete tends to degrade in mountain tunnels associated with strong acidic water outflows. The resulting functional degradation of these cementitious support materials is known to lead to problems. No cementitious support materials with acid resistance for use in mountain tunnels have been developed to date, and measures to combat acid deterioration have emerged as a key issue in this field. The purpose of this study is to develop rock bolt fixing materials and sprayed concrete with strong acid resistance.

Reducing the amount of cement is key to improving the acid resistance of cementitious support materials. One way to do so is to reduce the calcium hydroxide produced by hydration reactions between cement and water. On this basis, for use in mountain tunnels, we used acid-resistant cement in which half of the cement mass was replaced with silica fume and blast furnace slag fine powder. We carried out basic physical property tests and construction tests on rock bolt fixing materials and sprayed concrete using acid-resistant cement. These efforts resulted in a specific figure for the initial strength required for cementitious support material for mountain tunnels. We also confirmed acid resistance and workability equal to or better than that provided by conventional materials. Finally, the function of the cement-based support material will be ensured as expected in a corrosive environment due to strong acid spring water.

Key words: mountain tunnels, acid resistant, support materials, rock bolt fixing materials, sprayed concrete