

Numerical Analysis of the Hydrogen Leakage from a Fuel Cell Railway Vehicle Stationed in a Tunnel

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One of the initiatives to decarbonize railways is the development of fuel-cell vehicles. However, to put fuel-cell railway vehicles into practical use, it is necessary to confirm their safety, and one particularly important issue is the evaluation of hydrogen concentration in the event of a hydrogen leak in a tunnel. In this study, a numerical analysis was performed to investigate the hydrogen leak flow from a stationary railway test vehicle consisting of a two-car train set with a hydrogen leak in its roof equipment in a tunnel. The tunnel was a single-track, 400 m long mountain tunnel on a conventional Japanese railway. The Fire Dynamics Simulator (FDS) was used for the numerical analysis. The results showed that the leaked hydrogen rose towards the crown of the tunnel and flowed towards both tunnel portals. The hydrogen concentration was the highest immediately above the leak point and decreased rapidly towards both tunnel portals. In addition, the influence of the location of the leak on the hydrogen concentration distribution was also shown.