

Investigation of hydrogen gas safety for the electrochemical ballast water

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The ballast water has been identified as a major cause of ecological disturbance due to the pathogens and harmful adventive species discharged through the ballast water. Many techniques have been developed to diminish the aquatic invasive species in ballast water and sedimentations, an electrochemical treatment system shows advantages in disinfection efficiency and simple installation and maintenance of system. However, the explosion risk of the hydrogen gas produced by electrolysis system becomes a critical safety issue to the ship. The main aim of this study is to verify hydrogen gas safety in the ballast tank during a ballasting process. Multiphase computational fluid dynamic (CFD) model is developed to analyze a multiphase behavior of hydrogen gas and ballast water. Hydrogen gas concentration at vent pipe is also measured to verify CFD simulation model. Consequently, hydrogen gas is released into vent pipe normally at 200 ppm, and ballast water contains 0.3 ppm of hydrogen in average. The result means that hydrogen explosion is highly unlikely in the ballast tank.