Evaporation velocity of cryogenic liquid with and without spreading

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The study of liquid pool spreading plays an essential role in the quantitative risk assessment of accidentally released cryogenic liquids, such as LNG and liquefied hydrogen because the spreading of such liquids is the first step in the development of multi-staged accident sequences leading to a major disaster. There is a wide range of models used to describe the spreading of a cryogenic liquid pool. Many of these models require evaporation velocity, which has to be determined experimentally because the heat transfer process between the liquid pool and the surroundings is too complicated to be modeled. Measurement of the evaporation velocity has been conducted in the first place with a non-spreading pool that was formed by pouring of cryogenic liquid onto bounded ground instantaneously so that the discharge time was much smaller than the total evaporation time. Recently, the measurement methodology for a spreading pool was developed by the research team including the author. A constantly-released-flow onto unbounded ground was intended to generate the spreading pool because in almost all real accidents, a cryogenic liquid spills and spreads over a large or unbounded ground such that the pool spreading process should be taken into account. In case of the spreading pool, a high release flow rate is found to result in a high evaporation velocity, and the evaporation velocity decreases with the spreading time. Since the spreading pool in the author’s work receives heat more effectively from the ground as compared to the non-spreading pool, the measured evaporation velocities are much higher in the spreading pool than in the non-spreading pool.

Biography

Myungbae Kim has completed his PhD from Korea Advanced Institute of Science and Technology. He is the Principal Researcher of Korea Institute of Machinery and Materials and also the Professor of Plant System and Machinery, Korea University of Science and Technology. His research interests include the spread of liquid pool and fire, and explosion consequence analysis in the plant safety study.

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