

26. An Experimental Study on Sea Water Freezing Behavior in a Cooled Circular Tube

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In the adoption of a desalination system, the most important factor is production cost of fresh-water based on an energy source which should be obtained easily and cheaply. In general, we put LNG(Liquified Natural Gas) in storage as a liquid state at below-162°C in a tank. When it transforms to the gaseous state at high pressure, it absorbs energy from a heat source. In this process, a large amount of cold energy is wasted. This wasted cold energy can be utilized to produce fresh water by using a sea water freezing desalination system. First of all, we have to reveal the freezing mechanism of sea water so as to make the desalination system. The goals of this study is to measure the freezing quantity and freezing rate, and to investigate the freezing heat-transfer characteristics in a Circular Tube. The experimental results will help to provide a general understanding of the sea water freezing behavior to reach completion of the desalination system in the future.

Key Words : LNG Cold Energy(액화천연가스 보유냉열), Desalination System(담수화장치), Sea Water Freezing Behavior(해수동결거동), Freezing Heat-Transfer(동결열전달)

기호설명

F_0 : Fourier 수 [$\alpha \cdot \tau / H_0^2$] θ_w : 무차원 냉각면 온도 [$(T_f - T_w) / (T_0 - T_f)$]
 V_f : 냉각면 단위면적당 동결량 [m^3/m^2] H_0 : 초기 수용액의 높이 [mm]
 X : 원관내표면으로부터 중심까지의 거리 [mm] R_f : 무차원 동결량 [V_f/H_0]
 T_f : 농도에 따른 평형 동결온도 [°C] T_w : 냉각면 온도 [°C]