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Development of correlation for Thermophysical properties of supercritical Argon to be used futuristic HTS cables

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Most of the power transmission systems are to be replaced by high temperature superconducting (HTS) cables for efficient operation. These HTS cables need to be cooled below the critical temperature of superconductors used in constructing the cable. With the advent of new superconductors whose critical temperatures having reached up to 134K (Hg based), need arises to find a suitable coolant which can accommodate the heating load on the superconductors. In order to accomplish such challenge an attempt has been made in the present work to identify suitable Thermophysical properties of supercritical argon (SCAR). The Thermophysical properties such as density, viscosity, specific heat and thermal conductivity of SCAR found to be drastically varying with respect to temperature at a particular pressure. Moreover, it is observed that with an increase in pressure density and viscosity are increasing. In addition, as the temperature increases a shift in Thermophysical properties is observed. Few correlations are developed which are applicable over a wide range of temperatures. These correlations may be useful in thermohydraulic modeling of HTS cables using numerical or computational techniques. In recent times, with the sophistication of computer technology, solving of various transport equations with temperature dependent thermophysical properties became popular and hence the developed correlations would benefit the technological community.

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