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This report investigates the effect that oil concentration had on the boiling performance of an R123/paraffinic mineral oil mixture on a roughened, horizontal flat surface. For all compositions (0.5 %, 1 %, and 2 %), the lubricant caused a heat transfer degradation relative to the heat transfer of pure R123 of between 2 % and 70 % for the range of measured heat fluxes. The heat transfer degradation was shown to increase with lubricant mass fraction. The minimum heat transfer degradation for each mixture ranged between 2 % and 12 % and occurred at approximately 20 kW/m². For a given composition, the heat transfer degradation increased as the heat flux increased from roughly 20 kW/m² to 90 kW/m². In addition, the effect of two trial additives on the pool boiling heat transfer of an R123/paraffinic mineral oil mixture was examined in order to test the validity of a theory for choosing oil additives to enhance boiling performance. The verification tests were inconclusive. More research with lubricants and additives with greater differences in surface tensions is required to develop a more rigorous and quantifiable theory for designing additives that improve boiling heat transfer.
