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Measured and predicted thermodynamic properties of selected halon alternative/nitrogen mixtures*

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Experimental measurements of selected thermodynamic properties of alternative agent/nitrogen mixtures were performed. The selected alternatives were HFC-227ea (C_3HF_7), CF_3I, FC-218 (C_3F_8), and HFC-125 (C_2HF_5); CF_3Br was also included as a reference. A thermodynamic model based on an extended corresponding states principle was used. The model predictions were generally found to be within 10% or less of the experimental measurements. The model can be used as a computational tool for designers of fire extinguishers to obtain pressure–temperature relationships for selected halon alternative/nitrogen mixtures. Published by Elsevier Science Ltd and IIR
(Keywords: experimental methods, corresponding states model, halon alternatives, industrial applications)

Propriétés thermodynamiques mesurées et prévues pour une sélection de mélanges d' azote et de produits de remplacement de halons

On a mesuré expérimentalement certaines propriétes thermodynamiques de mélanges d' azote et de produits de remplacement. On a choisi comme produits de remplacement les HFC-227ea (C3HF7), FC-218 (C3F8) et HFC-125 (C2HF5); le CF3BR a aussi été pris à titre de référence. On a utilisé un modèle thermodynamique fondé sur le principe des états correspondants étendu. On a trouvé que les prévisions générales du modèle se trouvaient dans la limite de 10% autour des mesures expérimentales. On peut utiliser ce modèle comme outil de calcul pour les concepteurs d'extincteurs d'incendie pour obtenir les relations pression–température pour les mélanges d'azote et de produits de remplacement des halons. Published by Elsevier Science Ltd and IIR
(Mots clés: incendie, halon, substitut, nitrogen, melange, propriete thermodynamique, calcul, mesuré)

Current aircraft fire suppression bottles for in-flight fire protection are normally filled with liquid CF_3Br (halon 1301) to about one-half of the bottle volume, and the bottle is then pressurized with nitrogen to a specified equilibrium pressure (typically 4.1 MPa) at room temperature. The purpose of using the pressurization gas is to expedite the discharge of the agent and to facilitate the dispersion of the agent. Without nitrogen pressurization, the bottle pressure, which is simply the vapor pressure of the agent, can be so low, especially at cold ambience, that there is not enough driving force to rapidly expel the agent from the bottle in case of a fire.

Due to its high ozone-depleting potential, CF_3Br is now banned from production under the Montreal

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