Saturated Vapor Pressure of HFA152a – ethanol and HFO1234ze(E) – ethanol binary mixtures

Swetha Vutlapalli[1], Lingzhe Rao[1], Benjamin Myatt[2], Phil Cocks[2], Paul Young[3,4], Damon Honnery[1], **Daniel Duke**[1]

[1]Laboratory for Turbulence Research in Aerospace & Combustion (LTRAC), Department of Mechanical & Aerospace Engineering, Monash University, Melbourne 3800, Australia
[2]Kindeva Drug Delivery, Charnwood Campus, 10 Bakewell Road, Loughborough, United Kingdom, LE11 5RB
[3] Respiratory Technology, Woolcock Institute of Medical Research, Glebe, Sydney, NSW 2037, Australia
[4]Department of Marketing, Macquarie Business school, Macquarie University, Sydney, NSW 2109, Australia

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INTRODUCTION

- Due to rising concerns over global warming, the transition to low-GWP propellants has become a high priority for industry and governments.
- Low-GWP propellants HFA 152a and HFO 1234ze(E) are potential alternatives for HFA 134a and HFA 227ea [1,2].
- Due to differences in thermophysical properties, the transitions to low-GWP propellants in pMDIs is not a straightforward process due to the presence of cosolvent (ethanol).
- Property knowledge of pMDI formulations is essential to improve the performance of a pMDI product.

AIMS

- To measure the saturated vapor pressure of HFA152a-ethanol and HFO1234ze(E)-ethanol binary mixtures at cosolvent concentration of 8% w/w between 10° C to 50° C temperature.

RESULTS

METHODS

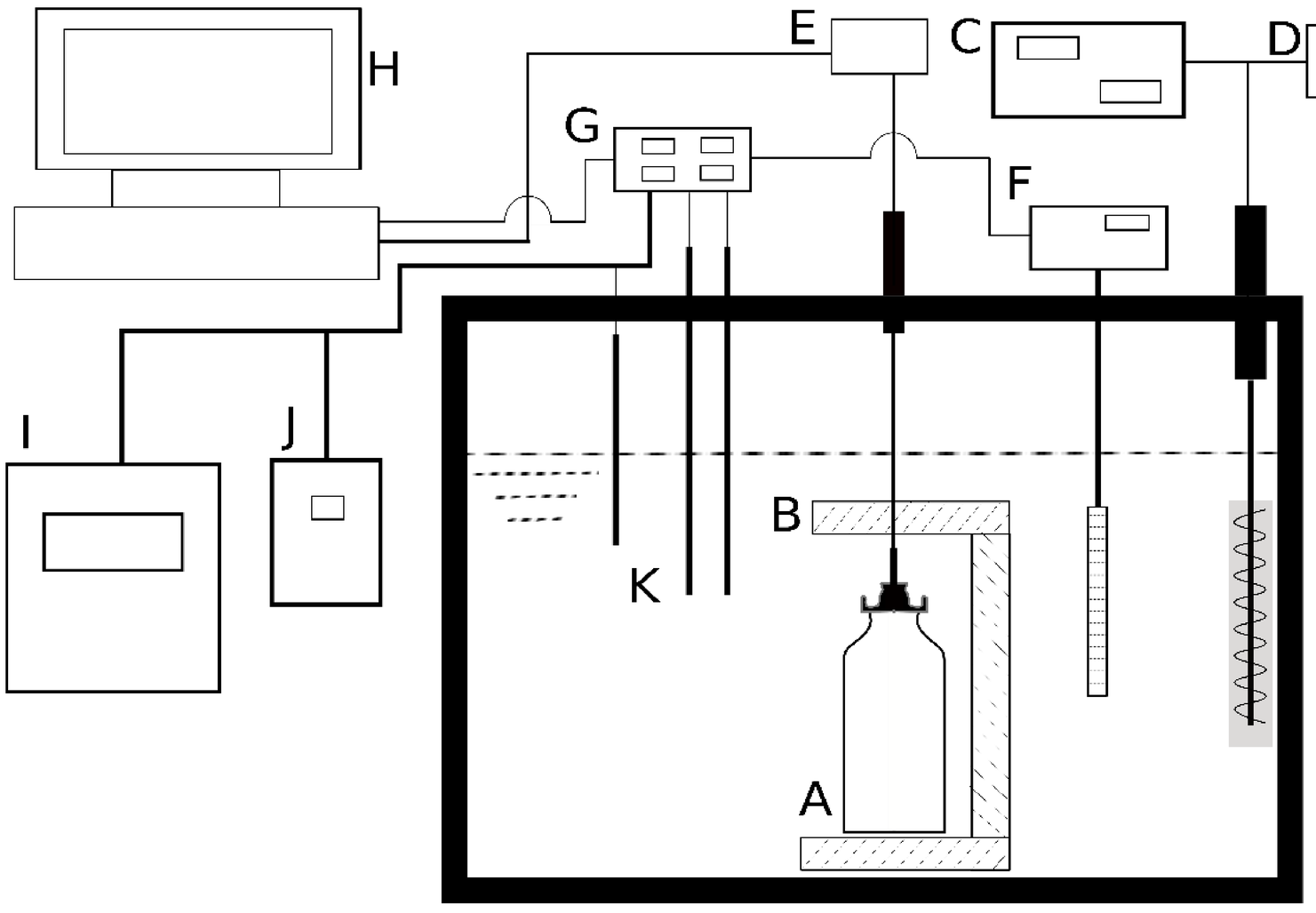
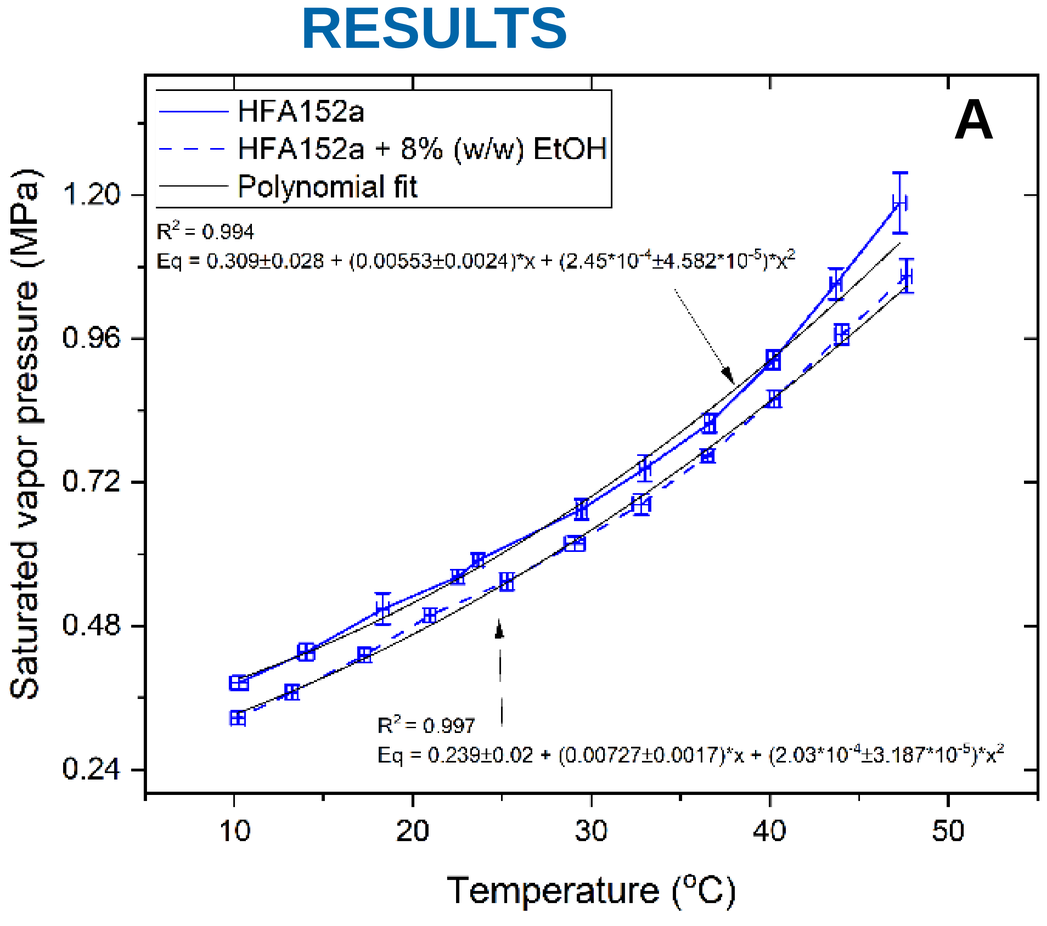


Figure 1. Saturated vapor pressure experimental apparatus A: Equilibrium cell, B: Canister holder, C: Heater, D: Heater transformer, E: Pressure transducer, F: Standard platinum resistance thermometer, G: Data collection port, H: Monitor, I: Freezer, J: Sub-Heater, K: Thermocouples



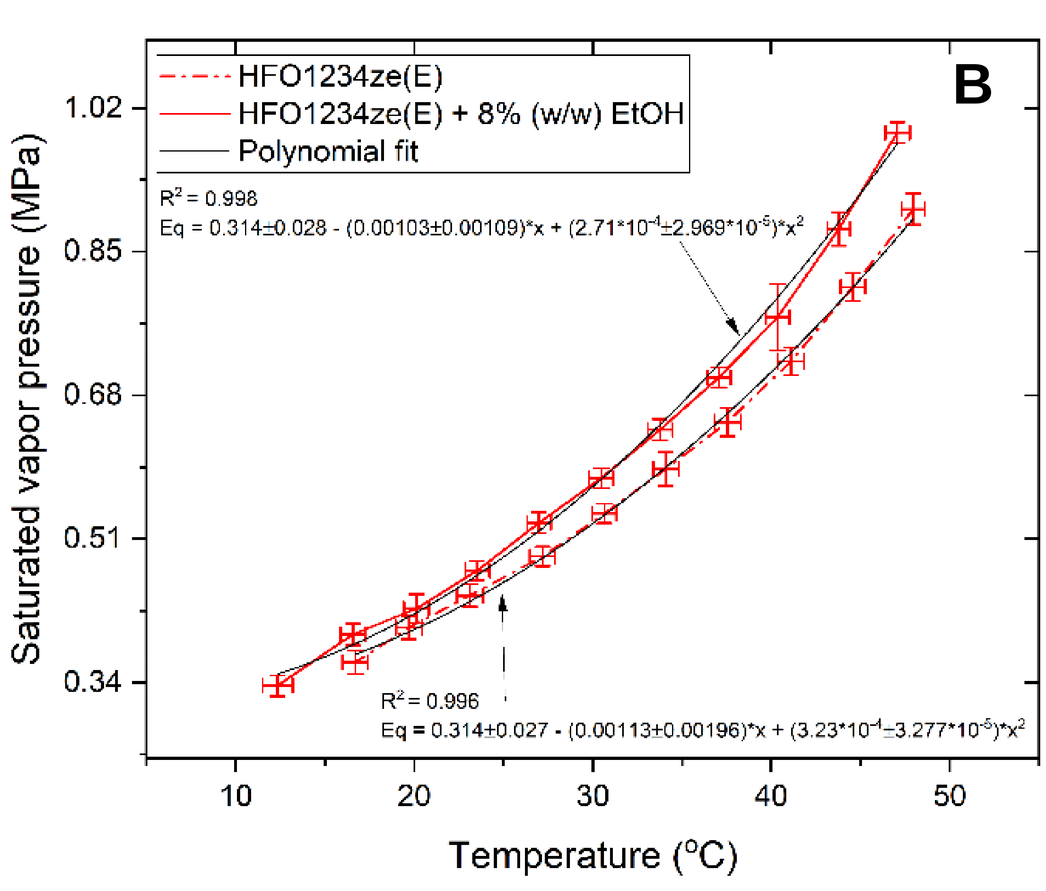
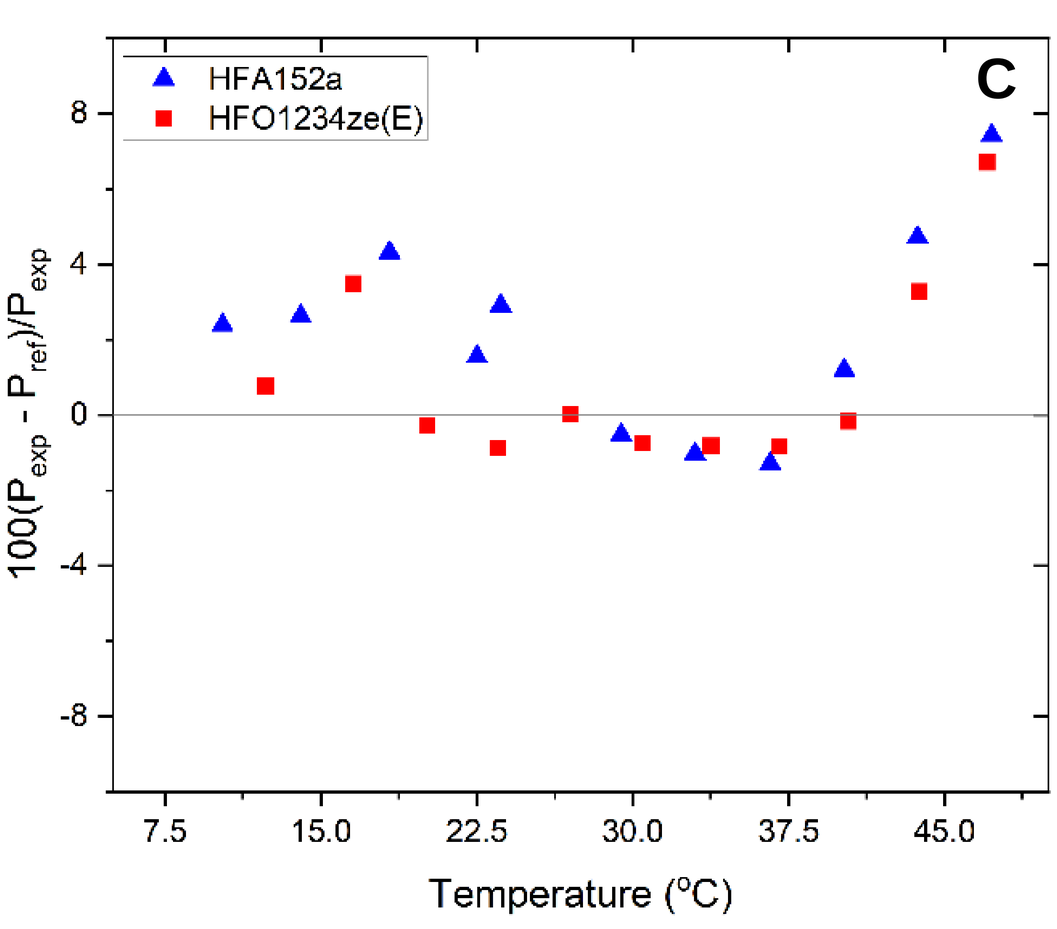


Figure 2. *[A & B]* Saturated vapor pressures of pure propellants HFA 152a and HFO 1234ze(E) and their binary mixtures with ethanol cosolvent concentration of 8% w/w

[C]

Relative deviation of measured and reference [3] vapor pressure for pure propellants



CONCLUSIONS

- The measured pure propellant saturated vapor pressures agree well with the NIST REFPROP database [3].
- Saturated vapor pressures of binary mixtures were measured with a maximum uncertainty of 0.49° C and 0.017 MPa in temperature and pressure respectively.
- The addition of ethanol cosolvent results in suppression of propellant vapor pressures in line with previous trends observed for HFA134a-ethanol binary mixtures

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[3] Lemmon, E. W., et al. "NIST Standard Reference Database 23*: Reference Fluid Thermodynamic and Transport Properties-REFPROP, Version 10.0, National Institute of Standards and Technology*." Standard Reference Data Program, Gaithersburg (2018)

ACKNOWLEDGEMENTS

The authors acknowledge the funding support from the Australian Research Council (DP200102016, LP190100938)