

# Low-GWP Building Blocks for HVAC and Refrigeration

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# Overview

- **Low GWP Refrigerant Development**
- **Physical Properties of key fluids**
- **Flammability Mitigation**
- **Global R&D efforts**

Refrigeration

Air conditioning

Propellant/blowing agent

Solvent

-80°C

-25°C

+50°C

R-410A  
R-404A/R-407A-F

R-134a/R-152a/R-227ea

R-245fa  
R-365mfc

Higher GWP

R-744  
**R-32**  
R-290  
R-170  
**R-1132a**  
**R-1123**

R-717  
R-161

**R-1234yf**  
**R-1234ze(E)**

R-152a  
R-600a

**R-1234ze(Z)**  
**R-1233zd(E)**  
**R-1336mzz**  
**R-1224yd(Z)**

Low GWP



# Low GWP Fluorocarbons

- **HFCs: R-32, R-152a will play a role**
- **Low GWP HFO fluids available in range of boiling points from -85C to +30C**
- **Many low GWP blends for optimised application performance now in development**

# HFO components

	ASHRAE Classification	Boiling Point (°C)	Critical temperature (°C)	Critical pressure (bar)
R-1132a	A2	-85.7	29.7	44.6
R-1123	Awaiting data	-56.0	59.2	46.0
R-1234yf	A2L	-29.4	94.7	33.8
R-1234ze(E)	A2L	-19.0	109.4	36.3
R-1224yd(Z)	A1	14.0	156.0	33.3
R-1233zd(E)	A1	18.3	165.6	35.7
R-1336mzz	A1	33.4	171.3	29.0

# Low GWP development

- **Technical development**
  - **Optimisation of blend compositions to match legislation and application needs**
- **Managing Flammability**
  - **Understanding of flammability characteristics**
  - **Development of safety standards and building codes**
  - **Significant R&D effort**

# Global R&D effort

- **ASHRAE and AHRI sponsoring work on “2L” refrigerants**
  - **Technology**
  - **Safety**
  - **Standards**
- **ISO standards also in development**

# Conclusions

- **Transition from existing fluids to new fluids underway**
  - **Some of the “new fluids” will still be well-known fluids like R-32**
- **New molecules available to help formulate efficient new refrigerants**



# Questions and Answers

