

1992

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Huttenlocher, D. F., "Chemical and Thermal Stability of Refrigerant/Lubricant Mixtures with Metals" (1992). *International Refrigeration and Air Conditioning Conference*. Paper 209.  
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CHEMICAL AND THERMAL STABILITY OF REFRIGERANT/LUBRICANT  
MIXTURES WITH METALS

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Chemical and thermal stability of refrigerants and lubricants are important considerations in the selection of these materials for air-conditioning and refrigeration systems. Most fluorocarbon refrigerants are quite stable, but they do decompose at elevated temperatures and especially in the presence of metals and other materials common to operating systems, such as lubricants.

Sealed glass tube tests have been a widely used bench-scale test method for the assessment of the stability of refrigerants. They have provided much useful technical information in a speedy and economical fashion. ANSI/ASHRAE Standard 97 describes a variety of sealed tube procedures.

This project used sealed tube test methodology based on Standard 97 to determine the stability of mixtures from among nine HCFC and HFC refrigerants and eight lubricants. Lubricants tested included petroleum based and synthetic hydrocarbons, polyglycols, and polyol esters. The fluid mixtures were aged in glass tubes in the presence of steel catalyst at three temperature levels, generally 150°C, 175°C, and 200°C. Sufficient replicate tubes were constructed for each test condition to provide the samples necessary for the analysis of the aged tubes as listed below.

Stability of the refrigerant/lubricant mixtures was assessed by the following measurements that were performed on the aged test samples:

- visual inspection of the aged glass tube contents,
- chloride or fluoride analysis, as appropriate, on all tube contents,
- gas chromatographic analysis of the vapor phase contents,
- analysis of the aged lubricants.