1. REPORT DATE (DD-MM-YYYY) 2. REPORT TYPE 3. DATES COVERED (From - To)

4. TITLE AND SUBTITLE  Technical Paper

5a. CONTRACT NUMBER 5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER 5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048

8. PERFORMING ORGANIZATION REPORT

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:
   a. REPORT  b. ABSTRACT  c. THIS PAGE

   Unclassified  Unclassified  Unclassified

17. LIMITATION OF ABSTRACT

18. NUMBER OF PAGES

19a. NAME OF RESPONSIBLE PERSON

Leilani Richardson

19b. TELEPHONE NUMBER (include area code)

(661) 275-5015

(5) separate items enclosed

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. 239.18
MEMORANDUM FOR PRS (In-House/Contractor Publication)

FROM: PROI (STINFO)                                     12 June 2002


Karl Christe (ERC) et al., “Nitrogen Fluoride Chemistry” (abstract)

ACS Meeting
(20 August 2002, Boston, MA)
Nitrogen Fluoride Chemistry

Ashwani Vij¹, William Wilson¹, Vandana Vij¹, F. Tham², M. Gerken³, and Karl Christe⁴. (1) Air Force Research Laboratory, Edwards AFB, CA 93524, ashwani.vij@edwards.af.mil, (2) University of California, Riverside, (3) University of Southern California, Los Angeles, (4) Air Force Research Laboratory, Edwards and University of Southern California, Los Angeles, Edwards AFB, CA 93524, Fax: 661-275 5471, karl.christe@edwards.af.mil

The isomerization of trans-N₂F₂ to cis-N₂F₂ going through N₂F⁺AsF₅⁻ is unpredictable, erratic, requires 2 steps, and consumes an equimolar amount of AsF₅. It was found that catalytic amounts of SbF₅ at 30°C can achieve this isomerization, but still result in substantial N₂F₂ losses due to N₂F⁺SbF₅⁻ formation. When the reaction is carried out at 60°C, surprisingly NF₄⁺SbF₅⁻·nSbF₅ is formed. The crystal structures of N₂F⁺SbF₅⁻ (disordered), N₂F⁺SbF₅⁻ (disordered), N₂F⁺Sb₂F₁₁⁻ (ordered), and NF₄⁺Sb₂F₁₁⁻ were determined and are discussed. AlF₃ was also studied as a catalyst for the N₂F₂ isomerization and was found to be an ideal catalyst resulting in very high conversions of trans-N₂F₂ and high yields of cis-N₂F₂. The AlF₃ can be used repeatedly without loss of activity or N₂F⁺ salt formation. Cis-N₂F₂ forms with SnF₄ at low temperatures a 2:1 salt, (N₂F⁺)₂SnF₆²⁻, that slowly loses N₂F₂ at room temperature to give N₂F⁺SnF₅⁻. The crystal structure of H₃NF⁺CF₃SO₃⁻ was also determined and exhibits a relatively long N-F bond.

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited