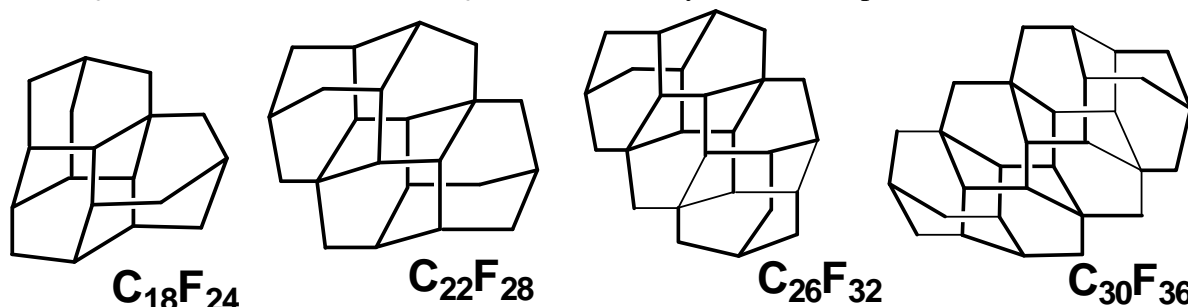


## Research in Fluorine Chemistry

The research area of Professor Jamie L. Adcock concerns the synthesis novel fluorinated molecules, Among these are the syntheses of perfluorinated diamondoid molecules. We have recently synthesized perfluorotri- ( $C_{18}F_{24}$ ) & tetraamantane ( $C_{22}F_{28}$ ) and will soon synthesize the penta- and hexamantanes:



These beautiful molecules provide the opportunity to study several unique features. Space filling models show a surface completely shielded by fluorines. F-tri- & F-tetraamantane are highly soluble in perfluorinated solvents and indeed are “fluoroscopic” in that they have a high affinity for fluorinated vapors and are deliquescent in them. Being large cages they offer the opportunity to study electron capture and loss in saturated systems. Structural and spectral studies indicate that, unlike the C-H analogs, the perfluorinated molecules have an interior carbon environment very similar to native diamond. Perhaps the most intriguing aspect is that diamonds have among the highest refractive indices of any crystal, while fluorocarbons have among the lowest. What optical behavior can be expected where a diamond core is “mated” with a perfluorinated skin. The Fluorine and Carbon NMR should also present some interesting patterns and coupling. Unique properties, both physical and spectroscopic, abound with these molecules, each having never been synthesized previously. We are also wish to begin a study of these large perfluorinated diamondoids having various pendant functionalities.

**UNIQUE PERFLUOROPOLYETHERS: Syntheses of molecules for lubricants and heat-transfer fluids in extreme environments:** The recent syntheses in this laboratory of a new family of perfluoro-polyether molecules with exceptional low-temperature properties and long liquid ranges present opportunities to expand horizons in materials for aerospace and computer applications.

**Boundary-layer Surface Modification & Lubrication Studies:** Hemiperfluorinated dendrimers present interesting possibilities for overcoming the perfluorocarbon-active-metal-surface electron-transfer interaction by chemical treatment of metal surfaces. A development likely to increase the utility of perfluoropolyether super-lubricants.

Persons having physical, analytical, polymer, inorganic as well as organic chemical interests will find interesting research problems in this group. Important techniques utilized in this laboratory include aerosol direct fluorination, fluidized-bed fluorinations, super-critical fluid synthesis, pressure and vacuum-line manipulation, inert atmosphere and dry-box techniques,  $^{19}F$  &  $^1H$  NMR, Raman and FT-IR Spectroscopy, High Resolution Mass Spectrometry, GCMS, Gas Chromatography, etc.

## REPRESENTATIVE PUBLICATIONS

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"Synthesis and Photochemical Reactions of Perfluorinated Carbonyl Containing Adamantane Derivatives," Adcock, James L. and Luo, Huimin, *J. Org. Chem.*, **1994**, 59, 5883-5885.

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