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Brief 69-10360

NASA TECH BRIEF

Improved Gyro-Flotation (Damping) Fluids

The problem:

Develop an improved stabilizer fluid for floated gyros. Floated gyros, depend upon high density (2.38 gm/cc), medium viscosity (900 cs), and gyro-flotation fluids to support the float, minimize the friction in the float bearings and damp the movement of the float. The sensitivity of a gyro can be increased with a fluid of higher density which could support a heavier float.

The solution:

Synthesize a metal-stabilized halophosphazene compound with a density of 3 gm/cc at 137°F.

How it's done:

The process used in this study was as follows: 123 gm $SbCl_3$, 186 gm PCl_3, 259 gm Br_2, 220 gm NH_4Br and 300 cc 1,2,4-trichlorobenzene (TCB) were brought to 145° in an oil bath and maintained at this temperature until the evolution of hydrogen halides was complete as measured by trapping in a caustic trap and back titration. The reaction was filtered hot and washed with hot TCB. The filtrate was then distilled in vacuo until the color indicated that it was bromine-free. Two phases form: a lower polymer phase, and an upper solvent phase. The solvent was siphoned off and the polymer washed free of cyclic phosphazene by-products with two 150 cc portions of CCl_4. The CCl_4 was in turn siphoned off. The lower polymer phase was then brought to 150°C and 30 μ pressure and held until it was solvent free. The yield was 189 gm of a dark, viscous, oil, d^{20}_4 –2.93 gm/cc 58° – 700 cs. The oil had the composition $P_3N_2Br_8Cl_3Sb$. The molecular weight determined cryoscopically in nitrobenzene was 1180.

Notes:

1. This disclosure should be of interest to manufacturers of precision instruments, and the chemical industry.
2. Documentation is available from:
   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: TSP69-10360

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Sanford S. Jacobs of
M and T Chemicals, Inc.
subcontractor to MIT
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Category 03