Storming Media Pentagon Reports: Fast. Definitive. Complete.

Home About Us Contact Us View Cart My Account FAQ

username LOGIN New Account » Forgot Password? Aluminum gas GO Advanced Search »

Chemistry . Inorganic Chemistry

Kinetics of Thermal Decomposition of Aluminum Hydride: I-non-Isothermal Decomposition Under Vacuum and in Inert Atmosphere (Argon)

Authors: I. M. Ismail; T. Hawkins; AIR FORCE RESEARCH LAB EDWARDS AFB CA

Ads by Google

Latest Myth Debunked:
Get The Facts On The US Chamber Position on Climate Change Here.
www.USChamber.com/Facts

Abstract: Recently, interest in alane (**aluminum** hydride) has been renewed as a rocket propulsion ingredient due to improvements in its manufacturing process and an increase in thermal stability. When alane is added to solid propellant formulations, rocket performance is enhanced and the specific impulse increases. Preliminary work was performed at AFRL on the characterization and evaluation of two alane samples. Decomposition kinetics have been determined from gravimetric TGA data and volumetric vacuum thermal stability (VTS) results. Chemical analysis showed the samples had 88.30% (by weight) **aluminum** and 9.96% hydrogen. The average density, as measured by helium pycnometery was 1.486 g/cc. Scanning electron microscopy showed that the particles were mostly composed of sharp edged crystallographic polyhedra such as simple cubes, cubic octahedron and hexagonal prisms. Thermogravimetric analysis was utilized to investigate the decomposition kinetics of alane in argon atmosphere and to shed light on the mechanism of alane decomposition. Two kinetic models have been successfully developed and used to propose a mechanism for the complete decomposition of alane and to predict its shelf-life during storage. Alane decomposes in two steps; the slowest is solely controlled by solid state nucleation of **aluminum** crystals; the fastest is due to growth of the crystals. Thus, during decomposition, hydrogen **gas** is liberated and the initial polyhedra AlH3 crystals yield a final mix of amorphous **aluminum** and **aluminum** crystals. The nucleation of **aluminum** crystals is the rate determining step. After establishing the kinetic model, prediction calculations indicated that alane can be stored in inert atmosphere at temperatures below 10 C for long periods of time (e.g. 15 years) without significant decomposition. After 15 years storage, the kinetic model predicts ~ 0.1% decompos

Adobe PDF - $18.95
Printed Format - $20.95
ADD TO CART
Please check the box for the format you wish to order.

Shipping Terms
About Electronic Delivery

Email This Abstract

Limitations:	APPROVED FOR PUBLIC RELEASE
Description:	Journal Article
Pages:	13
Report Date:	06 MAY 2005
Report Number:	A121144

Keywords relating to this report:

- *ALUMINUM COMPOUNDS
- *FORMULATIONS(CHEMISTRY)
- *FORMULATIONS_CHEMISTRY_
- *ISOTHERMS
- *THERMAL STABILITY
- *VACUUM
- AMORPHOUS MATERIALS
- ARGON
- ATMOSPHERES
- CHEMICAL ANALYSIS
- COMPUTATIONS
- CRYSTAL GROWTH
- DECOMPOSITION
- ELECTRON MICROSCOPY
- GASES
- HELIUM
- HYDROGEN
- KINETICS

- MANUFACTURING
- NUCLEATION
- PRISMS_OPTICS_
- PROPELLANTS
- PYROLYSIS
- RARE GASES
- RECTANGULAR BODIES
- ROCKETS
- SCANNING ELECTRON MICROSCOPES
- SOLID PROPELLANTS
- SPECIFIC IMPULSE
- STORAGE
- THERMOGRAVIMETRIC ANALYSIS

« Back to search

© 2001-2012 Storming Media LLC. All rights reserved.