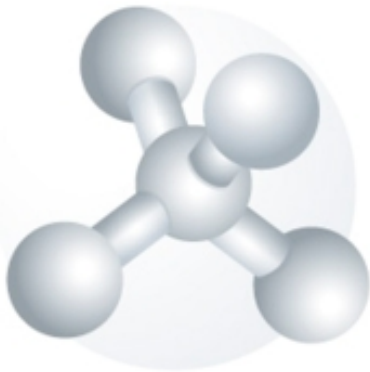


ALOHA™ Special Precursors



CYPRUS

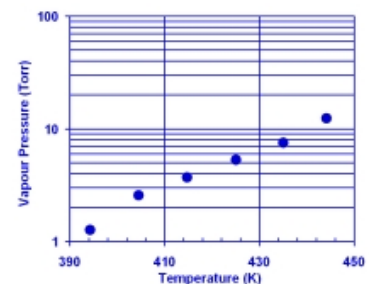
AL developed new liquid Ru precursor for high performance and high quality CVD

CAS n° Confidential

- Ruthenium is used as an electrode material over high-k dielectric capacitors in MIM structure. It is also envisaged as a metal gate material in 45 nm and below devices, and in BEOL as a direct adhesion and seed layer for electroplating.
- Air Liquide R&D developed a new Ru precursor, CYPRUS, which is highly stable to air and water, and leads to high quality depositions.
- CYPRUS shows no incubation time for CVD process on TaN and SiO₂ substrates in combination with O₂. And the obtained film shows very good conformality and adhesion.
- In addition, Cyprus exhibit similar vapor pressure to the standard Ru precursor, Ru(EtCp)₂.
- Like for most of the ALOHA advanced products, each canister of CYPRUS is supplied with a BALAZS CofA and meets stringent purity requirements. Please consult www.balazs.com for more information on Air Liquide's BALAZS analytical services.
- Main application: Metal gate, Electrode, SRO

Physical Chemical Properties

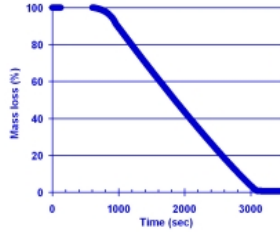
Properties	
Molecular Weight	Confidential
Physical State	Liquid
Colour	Yellow
Vapour Pressure	1 Torr @ 115°C
Decomposition Temperature	~ 300°C



CYPRUS thermal property

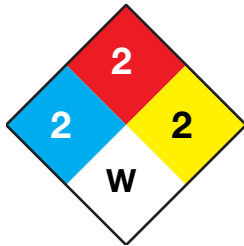
Isothermal TGA of CYPRUS (160°C)

- CYPRUS shows only negligible residue (about 0.6%), very clean evaporation property.



- Please consult ALOHA™ for more detailed and updated R&D data.

Hazard Rating



HMIS

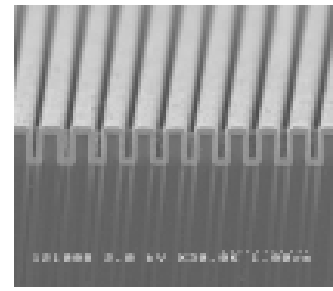
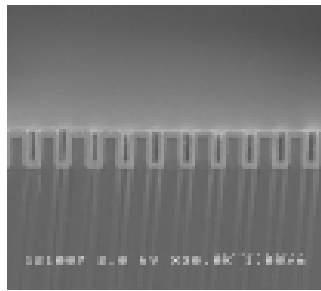
Health: 2
Flammability: 2
Reactivity: 2

- Please consult ALOHA for detailed material compatibility recommendation.

CYPRUS CVD Performances

SEM Pictures on 3:1 patterned wafer:

- Bubbling delivery - Temp. : 350C
- CYPRUS gives pure Ru film with good conformality and good adhesion.



Packaging & Dispensing System

- CYPRUS can be packaged in a variety of canisters depending on the application.
- For on-board applications, CYPRUS is usually supplied in canisters with various valving and dip-tube configurations. Multipoint or continuous level sensing systems can also be customized to meet each specific requirements. ALOHA's on-board canisters have all-metal construction and are cleaned and dried by state of the art techniques.
- CYPRUS can also be filled in properly documented customer-supplied canisters.
- Smaller R&D level packages are available as well for basic research needs.



Transport Information

- Proper shipping name: Organometallic substance, liquid, water reactive. n.o.s.
- UN Number: 3398
- Hazard Class / Description: 4.3 (Dangerous When Wet)
- Hazard Label Required: Class 4.3 (Dangerous When Wet)
- Packing group: II



Air Liquide ALOHA is providing a complete advanced precursor solution. ALOHA portfolio covers low k, high k, barrier, metal gate, electrode, including some proprietary solutions for SiN, metals and High k. Certain aspects of Air Liquide technology may be covered by Air Liquide Intellectual Property rights.

For more information please contact: aloha@airliquide.com or your local Air Liquide representative.

