VIRIDIS CHEMICALS PRIVATE LIMITED

MAKE IN INDIA

Viridis' VSAF CAT®

HEFA to SAF Hydroisomerization Catalyst

Introduction

The global aviation sector is rapidly transitioning toward lowcarbon energy sources, making sustainable aviation fuel (SAF) a strategic requirement for reducing lifecycle greenhousegas emissions. Among the certified and technologically mature pathways for SAF production, the HEFA (Hydroprocessed Esters and Fatty Acids) route is currently the most commercially deployed worldwide.

Process Details – HEFA to SAF

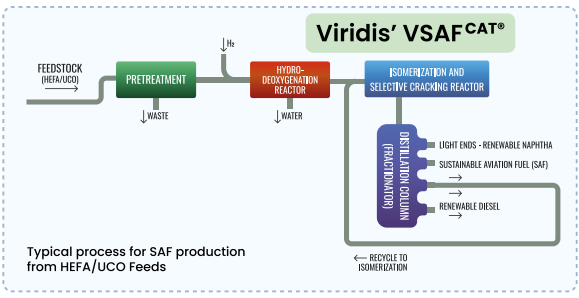

Figure 1: Typical process flow for production of SAF from HEFA/UCO feeds

VSAF CAT® Performance Data

The VSAF CAT® technology was tested for different hydrocarbon blends that are typically observed in heavy hydrodeoxygenated HEFA feeds viz. C_{14}, C_{16} and C_{22} alkanes; the kerosine cut of C_{10}-C_{16} is most relevant for jet fuel applications.

Performance Evaluation Conditions

Temperature (°C)	225
Pressure (bar)	50
H_2/HC	2.5
WHSV (h^{-1})	1.0

Desired Catalyst Characteristics for Hydroisomerization of HDO-HEFA to SAF

- Produce hydrocarbons with freezing point ~ -40°C
- Kerosine range hydrocarbons (C_{10} to C_{16})
- Irregular multi-branched isomers
- Minimal undesired cracking for maximum yield
- Low temperature operation
- Low H_2 consumption

Viridis' VSAF CAT® – Selective Hydro-Isomerization Catalyst

✓ Optimally tuned catalyst acidity for highly selective hydroisomerization
✓ Low temperature operation ~ 220° – 260°C
✓ Flexible pressure operation ~ 30 to 60 bar
✓ Low H_2 consumption ~ H_2/HC < 3
✓ High product yields – Minimal Undesired Cracking
✓ High stability – Long Life

Hydrocarbon	Conversion	Selectivity to mono-branched isomers	Selectivity to Di+Tri+Multi-branched isomers	Cracked Products
C_{14}	90%	19%	79.2%	1.8%
C_{16}	88%	20%	77.5%	2.5%
C_{22}	86%	22%	73.4%	4.6%

Stated high multi-branched isomer content indicates low freezing point

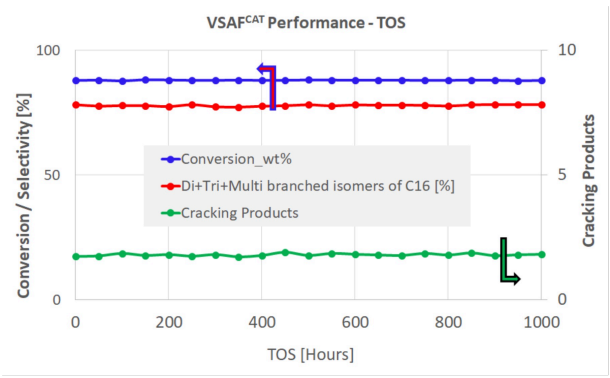

Figure 2: Extended duration operation of VSAF CAT® with C_{14}+C_{16}+C_{22} feed

Process Conditions – VSAF CAT® operation with n-Hexadecane (n-C_{16})

Run ID	T (°C)	P (bar)	H_2/HC	WHSV (h^{-1})	Conv. (wt.%)	Di+Tri + Multi branched isomers of C_{16} (wt.%)	Cracked (wt. %)
R1	220	30	2.0	2.0	80.2	70.4	2.8
R1	240	35	2.5	2.0	84.6	73.1	3.4
R1	255	30	2.9	2.0	87.9	72.6	4.2

Effect of Moisture Excursions on VSAF CAT®

Since the HDO (hydrodeoxygenation) reactor produces water as a product, upsets are to be expected during the operation of the unit. VSAF CAT® is highly stable with respect to moisture excursions in the feed. The data below shows the effect of moisture on the catalyst during operation. VSAF CAT® fully recovers performance once the moisture in the feed is removed and the operation is stabilized without any additional pretreatment of the catalyst.

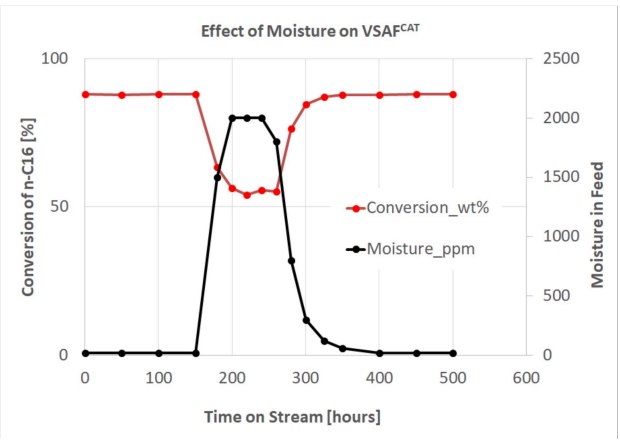

Figure 3: Effect of moisture on VSAF CAT® during potential HDO upset scenario

Viridis' VSAF CAT® – Your one stop solution for HEFA based hydrocarbon hydroisomerization