Novel process for manufacturing Dimethyl Ether (DME) from methanol

EXECUTIVE SUMMARY

CSIR-NCL has developed a novel process technology to manufacture dimethyl ether (DME) from methanol. DME is a versatile clean-burning fuel that can be blended with LPG. DME is a key end-point in a methanol economy value chain. CSIR-NCL's process features a novel, robust & reusable catalyst with high selectivity & conversion. The process has been scaled up to 24 L/day.

BACKGROUND

- DME (CAS No: 115-10-6) is a clean-burning fuel (low-carbon, soot-free, reduced NOx, SOx, & particulate matter) with major applications as LPG blend (up to 20%) & diesel substitute
- DME is commonly produced from methanol. It can be a value-added product in methanol value chain & potentially renewable

TECHNOLOGY KEY FEATURES

- A highly active, scalable, selective, cost-effective, stable & water tolerant metal oxide catalyst
- A novel reactor design which allows *in situ* product separation without an extra purification step
- Process flexibility

- **Key outcomes & process parameters**
  - Selectivity: > 98 % (10 bar)
  - Conversion: > 84 % (10 bar)
  - Regeneration: Simple protocol is ready
  - Temperature: 250 - 280^{0}C
  - Pressure: at atmospheric pressure & 10 bar
  - Catalyst loading **:** 1 kg is tested for time on stream 500 hrs (continuous way)

MARKET POTENTIAL

- Global DME market is expected to grow from 5.9 (2019) to 10.8 Billion USD (2025), with a CAGR of 8.5 %. The Asia-Pacific region is the dominant market for DME[1]

VALUE PROPOSITION

- Solid catalyst: cost-effective, robust & reusable
- Process flexibility
- Novel reactor design: *In situ* DME purification & higher reaction throughput
- IP protection with multiple patents

DME APPLICATIONS

- Domestic-sector fuel: LPG blending (20 %)
- Aerosol propellant: Pharma & cosmetics
- Transportation fuel: Diesel/fuel cell vehicles
- Power plant fuel: Thermal plants
- Chemical feedstock: For valuable chemicals

TECHNOLOGY STATUS

- Technology developed at 20-24 L/day in a pilot plant
- Contract manufacturer for the catalyst is identified
- Technology & patents are available for licensing/co-development
- Patents filed: **IN201811021506, IN201911020867, IN201911000855**

REFERENCES

1. https://www.gminsights.com/industry-analysis/dimethyl-ether-dme-market

https://indianexpress.com/article/cities/pune/ncl-sets-up-pilot-plant-to-produce-clean-fuel-that-can-replace-diesel-6001177/

CSIR-National Chemical Laboratory, Pune, India

Case Manager: **Mangesh Vetal|+91-20-2590-2981|md.vetal@ncl.res.in**