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Selective catalytic combustion of hydrocarbons

A novel method for the selective combustion of acetylene in a mixture of other hydrocarbons over a metal oxide catalyst.

IP Status: Provisional Patent Application Filed

Applications

- Removal of acetylene from gaseous hydrocarbon mixtures
- Ethylene purification

Key Benefits & Differentiators

- **Safe:** this method avoids simultaneously feeding oxygen and hydrocarbons at high temperatures
- **Selective:** acetylene is selectively combusted in the presence of excess ethylene
- **Industrially relevant:** acetylene concentrations below 2 ppm are achievable, which is important for polymer-grade ethylene

Technology Overview

Ethylene is industrially produced through the steam cracking of petroleum hydrocarbons and typically contains traces of acetylene impurities. Transition metal polymerization catalysts commonly used in polyethylene production are highly susceptible to poisoning and deactivation by acetylene, thus its removal is of paramount importance. Currently, this is accomplished via the semi-hydrogenation of acetylene into ethylene by a palladium catalyst. However, this reactivity requires high pressures which are not only energy-intensive and costly but can also have a detrimental effect on polymer quality.

Researchers at the University of Minnesota have developed a novel method to selectively combust acetylene in a mixture of other combustible hydrocarbons. A metal oxide catalyst is used in conjunction with oxygen to selectively oxidize acetylene. This technology avoids the safety challenges of simultaneously feeding oxygen and hydrocarbons together at high temperatures. Instead, the metal oxide catalyst is employed in successive reduction/oxidation cycles to achieve selective acetylene combustion.

Phase of Development

TRL: 3-4
Selective combustion of dilute acetylene in ethylene mixtures has been demonstrated.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Technology ID
2023-247

Category
Engineering & Physical Sciences/Chemicals
Engineering & Physical Sciences/Materials
Engineering & Physical Sciences/Processes

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Researchers

- **Aditya Bhan, PhD** Distinguished McKnight University Professor, Department of Chemical Engineering and Materials Science

References

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