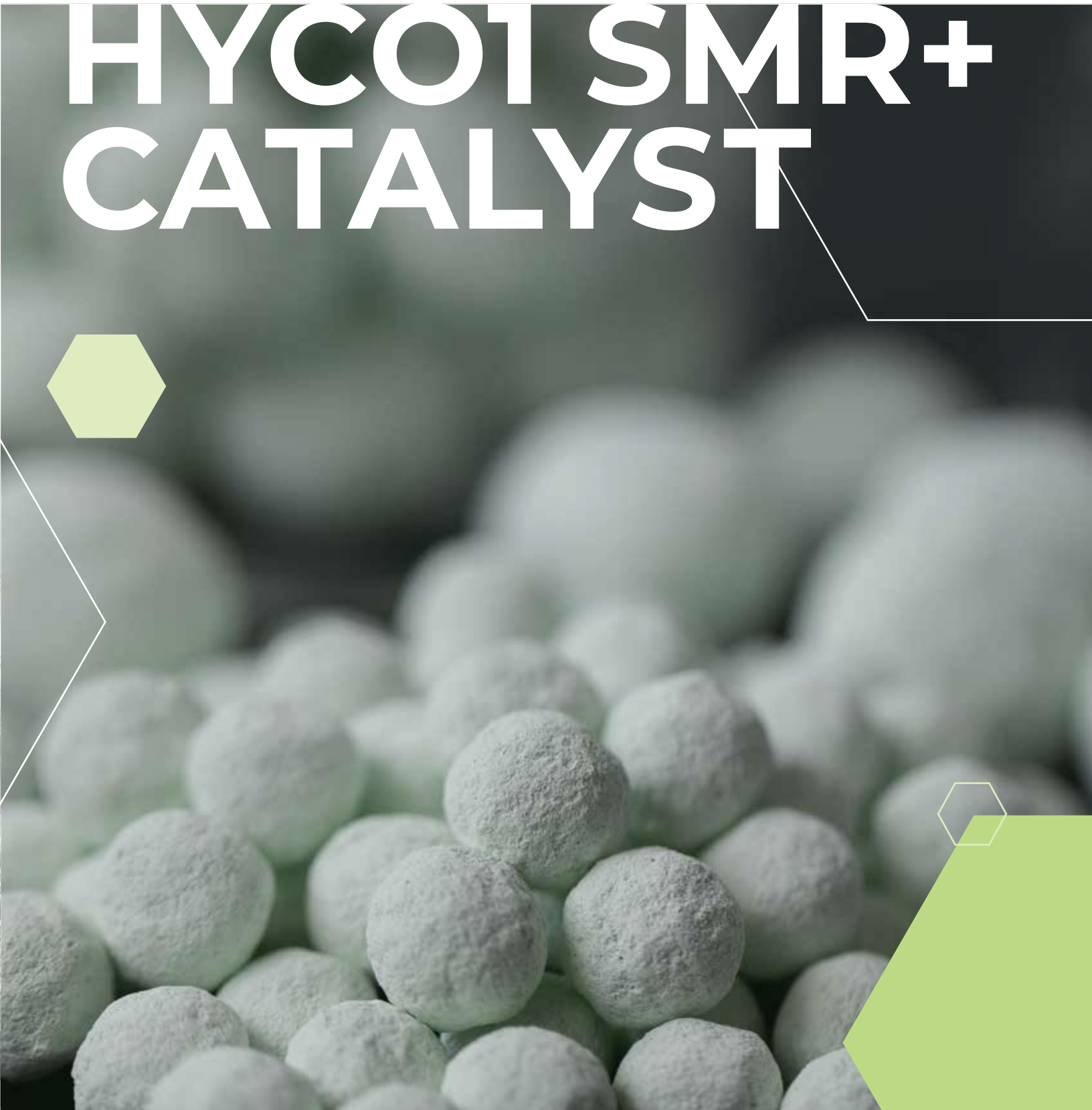
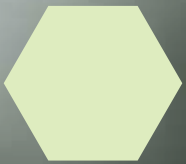




HYCO1

CARBON NEGATIVE. PLANET POSITIVE.

HYCO1 SMR+ CATALYST



HYCOI'S SMR+ CATALYST IS A STEP ABOVE

HYCOI's SMR+ Catalyst sets a new standard in syngas production with unmatched performance, reliability, and efficiency. This breakthrough technology offers exceptional high-temperature durability, non-coking properties, and industry-leading crush strength. Its advanced design ensures optimized heat transfer, minimized pressure drop, and consistent gas flow. Additionally, it allows precise control of the hydrogen-to-carbon monoxide ratio, making it the most flexible, high-performance catalyst available. Backed by HYCOI's commitment to quality and innovation, the SMR+ Catalyst represents a transformative leap in syngas technology.

KEY ADVANTAGES OF HYCOI'S SMR+ CATALYST

OPERATIONAL ROBUSTNESS

- **Non-Coking:** SMR+ Catalyst is fully non-coking, meaning no downtime due to carbon buildup on the catalyst.
- **Pre-Sintered Design:** Eliminates common failure mechanisms including sintering and metal migration, ensuring long-lasting performance.
- **Superior Durability:** Industry-leading crush strength (2200 N) ensures resistance to wear and attrition.

OPERATIONAL FLEXIBILITY

- **Improved Steam-to-Carbon Ratio:** Non-coking properties enable operators to fine-tune steam-to-carbon inputs for maximum efficiency and composition control.
- **Versatility Across Applications:** Adaptable to various syngas production processes, from steam reforming (primary and secondary) to true dry methane reforming.
- **Flexible Rates:** The ability to increase feed by up to 35% or turn down by up to 50% with little to no change in conversion efficiency.
- **Tailored Syngas Ratios:** Allows precise control of hydrogen-to-carbon monoxide ratios, meeting diverse process requirements.

OPERATIONAL EFFICIENCY

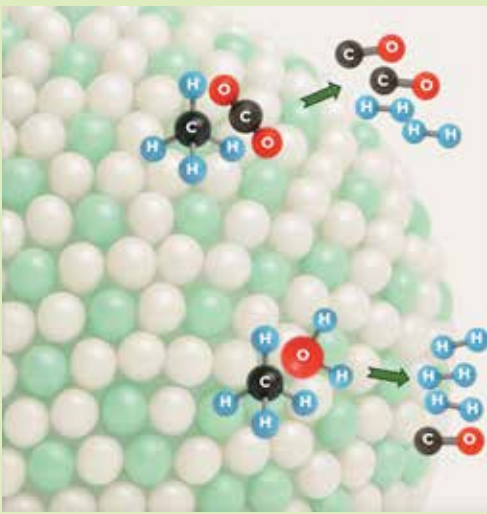
- **Opportunity to Lower Steam:** Reduces energy demand for steam production, cutting operational costs significantly.
- **Production Debottlenecking:** Freeing up capacity enabling increased throughput.
- **Lower Carbon Intensity:** Improves carbon monoxide (CO) output while minimizing overall carbon emissions.
- **Reduced Environmental Impact:** Achieves a lower carbon footprint and decreases greenhouse gas emissions.
- **Optimized Energy Use:** Enhances heat and mass transfer efficiency, reducing energy consumption.



SOLVING SMR'S BIGGEST CHALLENGES

HYCOI INNOVATIVE SOLUTIONS:

- **Sintering** - a process that causes a loss of catalytic activity and surface area and can even lead to collapse of the catalyst support.
 - **HYCOI Risk Mitigation:** the catalyst is pre-sintered as part of the catalyst production method. HYCOI's SMR+ catalyst has already achieved its stable final structure, which eliminates sintering in operation and maintains activity and strength much longer than conventional catalysts.
- **Metal Migration** - over time, nickel atoms move and combine to form larger agglomerations of nickel, which reduces the available active nickel surface area and results in the loss of activity and conversion.
 - **HYCOI Risk Mitigation:** HYCOI's SMR+ Catalyst is a new solid-solution alloy, which locks the active metals in place and prevents metal migration.
- **Coking** - graphitic coke can form from the active alumina carrier and reduced nickel in traditional catalyst. Graphitic coke will foul the catalyst, increasing pressure drop in the SMR, and ultimately cause pre-mature catalyst change out.
 - **HYCOI Risk Mitigation:** HYCOI's SMR+ catalyst will not form graphitic coke since the ceramic carrier has a full surface coating of the solid solution metallic active catalyst. As a result, Dry Methane Reforming with no steam input has been achieved with SMR+. Additionally, steam-to-carbon ratios for SMR operation can be significantly lowered without the risk of forming graphitic coke.



WHY SMR+ IS DIFFERENT:

Lower DP, more throughput: Spherical shape improves flow dynamics and reduces pressure drop, allowing increased feed at the same DP.

Bonus reaction for more H₂: Near the SMR tube outlet, $\text{CO}_2 + \text{CH}_4 \rightarrow 2 \text{CO} + 2 \text{H}_2$ — shifting equilibrium and producing additional hydrogen in the SMR.

Extra hydrogen from CO shift: Additional CO is easily converted to H₂ in downstream shift reactors.

Ultra-low slip: CH₄ and CO₂ slip both < 1% (often < 0.5% CH₄).

Handles heavier feeds: Processes CO₂ and C₄s without coking.

Easy “pour-in” loading: Even packing, strong ceramic carrier, drop-in replacement — no hardware changes.

ENHANCED REACTOR EFFICIENCY THROUGH LOWER PRESSURE DROP

The spherical shape of HYCO1's SMR+ catalyst ensures uniform packing and minimal resistance to flow, enabling lower pressure drop across the reformer tubes. This translates into reduced compression costs and higher throughput — without compromising conversion.

OPTIMIZED HEAT TRANSFER FOR PRECISE THERMAL CONTROL

Spherical geometry promotes even radial heat distribution and minimizes localized hotspots along the reformer tube wall. This leads to more uniform tube temperatures, reduced thermal stress, and safer, more efficient start-up and shutdown cycles.

ADVANCED ALLOY SURFACE FOR SUPERIOR REACTIVITY

SMR+ leverages a proprietary NiMgO engineered solid solution surface alloy that resists carbon formation while enhancing CO₂ activation. The result is a catalyst that operates with higher stability, longer life, and sustained performance in both SMR and DRM environments.

STREAMLINED GAS FLOW DYNAMICS FOR MAXIMUM CONVERSION

The consistent void space between SMR+ spheres fosters uniform gas velocity and mixing, improving residence time utilization. This supports superior performance along the tube length — especially critical in high-efficiency syngas generation.

CATALYST PHYSICAL CHARACTERISTICS:

14mm spheres +/- 1.5mm

Light green mint color

SiO₂ and Al₂O₃ carrier

Maximum recommended operating temperature 1000 degrees Celsius

2200 (N) crush strength

Bulk Density – 80-86 (Lb./ft³)

HYCO1 catalysts are proudly assembled in Houston, TX.

R&D operations are mainly conducted in our catalyst characterization facility in Houston, which also is the corporate headquarters supporting catalyst sales and support.



**READY TO REVOLUTIONIZE YOUR SYNGAS PRODUCTION?
UPGRADE TO THE HYCO1 SMR+ CATALYST TODAY AND
EXPERIENCE UNPARALLELED PERFORMANCE, EFFICIENCY,
AND FLEXIBILITY.**

VISIT HYCO1.COM TO LEARN MORE

 281.454.4224

 info@hyco1.com

 15403 Vantage Pkwy E Suite 320,
Houston, TX 77032