

**Next generation hydrogen production process  
can realize **Hydrogen Energy Society****

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# Improved Three Way Catalyst for Automobile

( Based on the results of NEDO PJ(2011) & METI PJ(2012) )

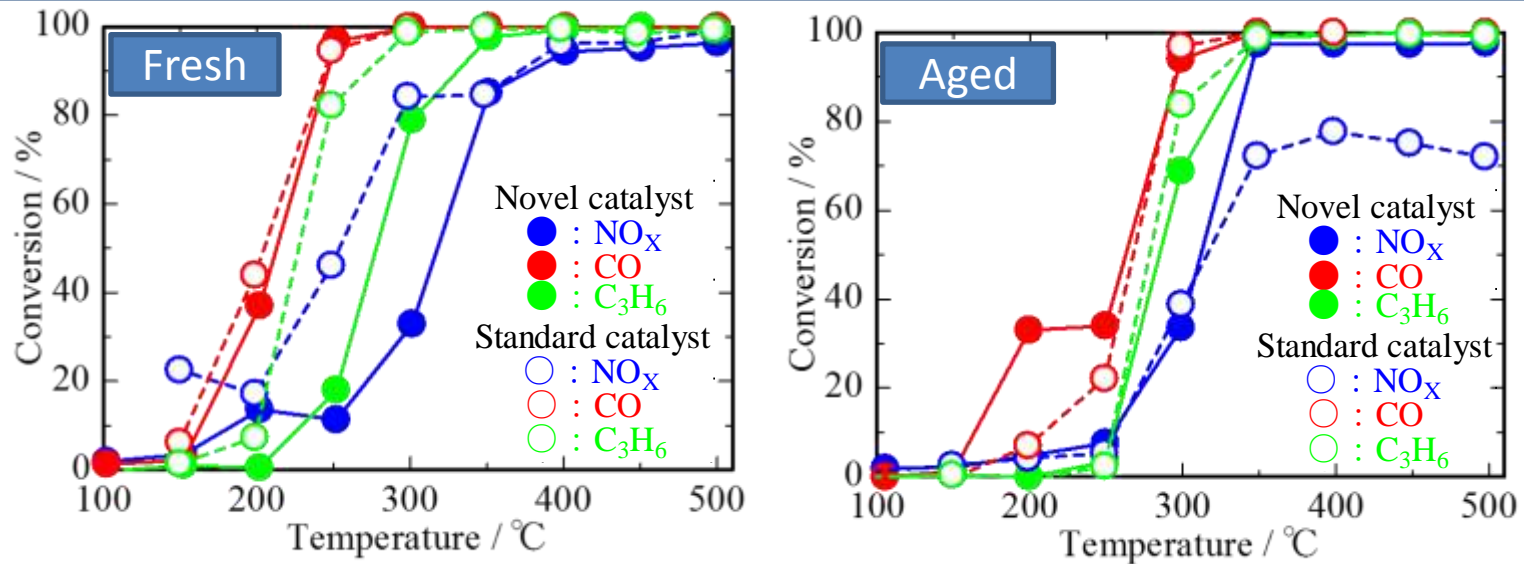


Fig. Conversion curves of C<sub>3</sub>H<sub>6</sub>, CO and NO<sub>x</sub> over the novel catalysts.

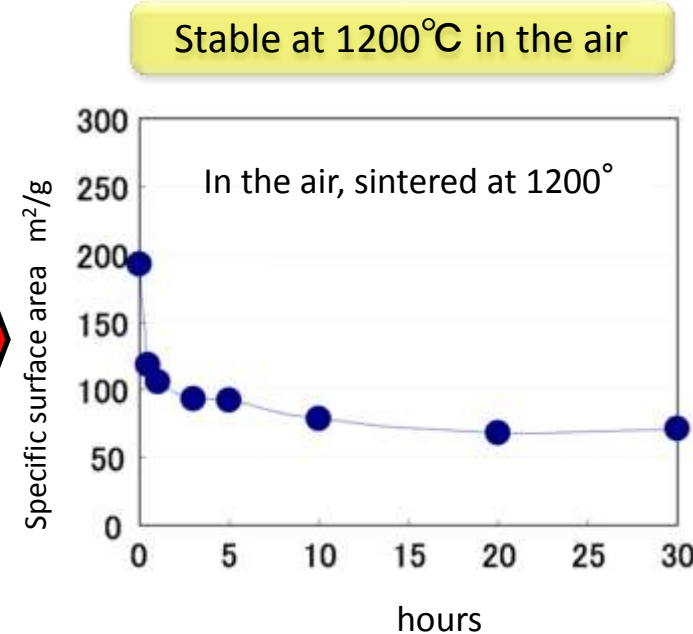
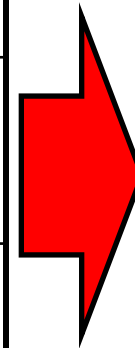
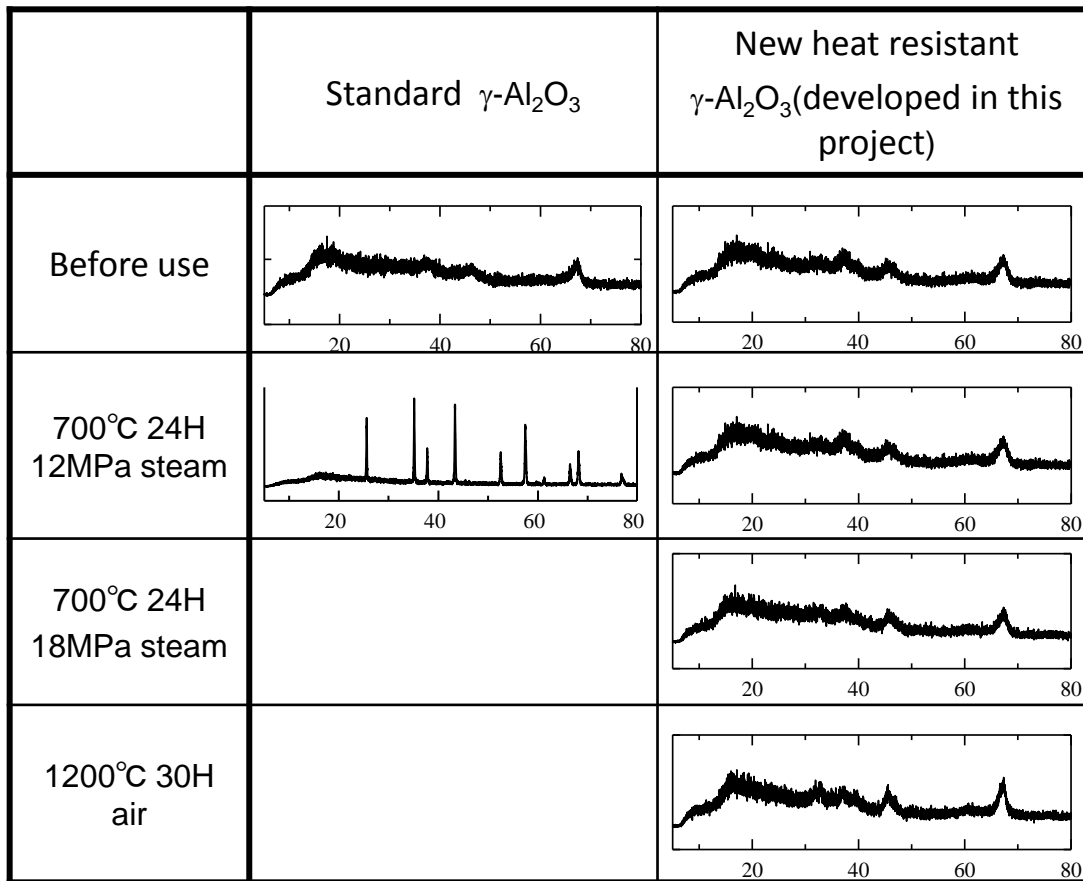
Standard catalyst 1%Rh/CeO<sub>2</sub> : Pd/Al<sub>2</sub>O<sub>3</sub> = 1 : 2

Novel catalyst Rh/Improved ceria : Pd/Novel heat resistance Al<sub>2</sub>O<sub>3</sub> = 1 : 4

Ceria (−40%), Pd (−30%) and Rh (−40%)

Significant reduction both ceria and noble metal was achieved using combination of **Heat resistant  $\gamma$ - alumina** and **high performance ceria**

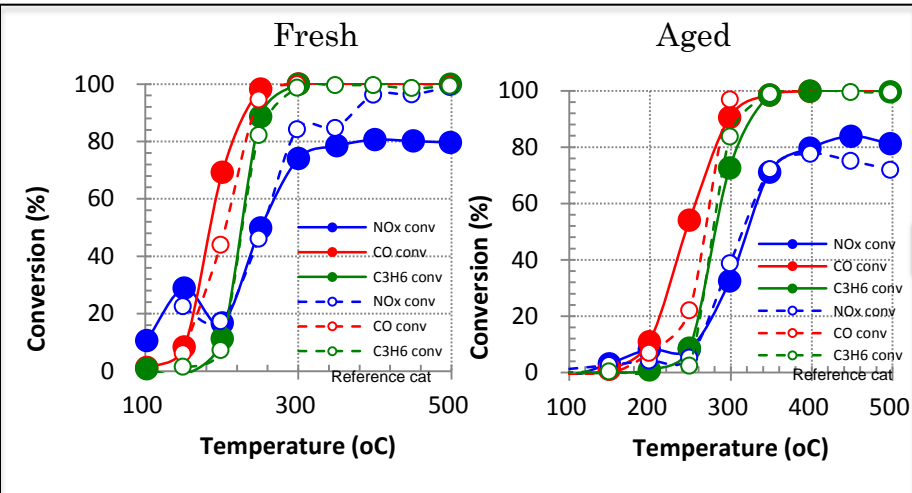
We succeeded in development of new catalyst support which maintain a large surface area in the automotive exhaust gas conditions..



**Stability of newly developed heat resistant  $\gamma$  - Al<sub>2</sub>O<sub>3</sub> was significantly improved compared to the existing  $\gamma$  - Al<sub>2</sub>O<sub>3</sub>.**

# Effect of improved ceria

Result of the high Performance Ceria  
Obtained in 2011

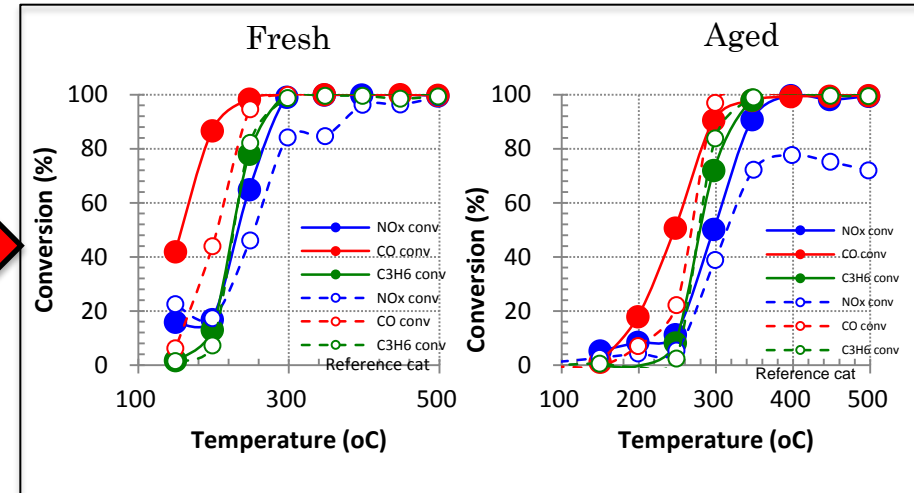


TWC result of Improved ceria (2011ver.)  
(reference catalyst composition)

Ceria : Alumina = 1 : 2  
1% Rh on Ceria  
2.5% Pd on Alumina

**Aged catalyst shows  
higher performance than  
the reference catalyst**

Result of the high Performance Ceria  
Obtained in 2012



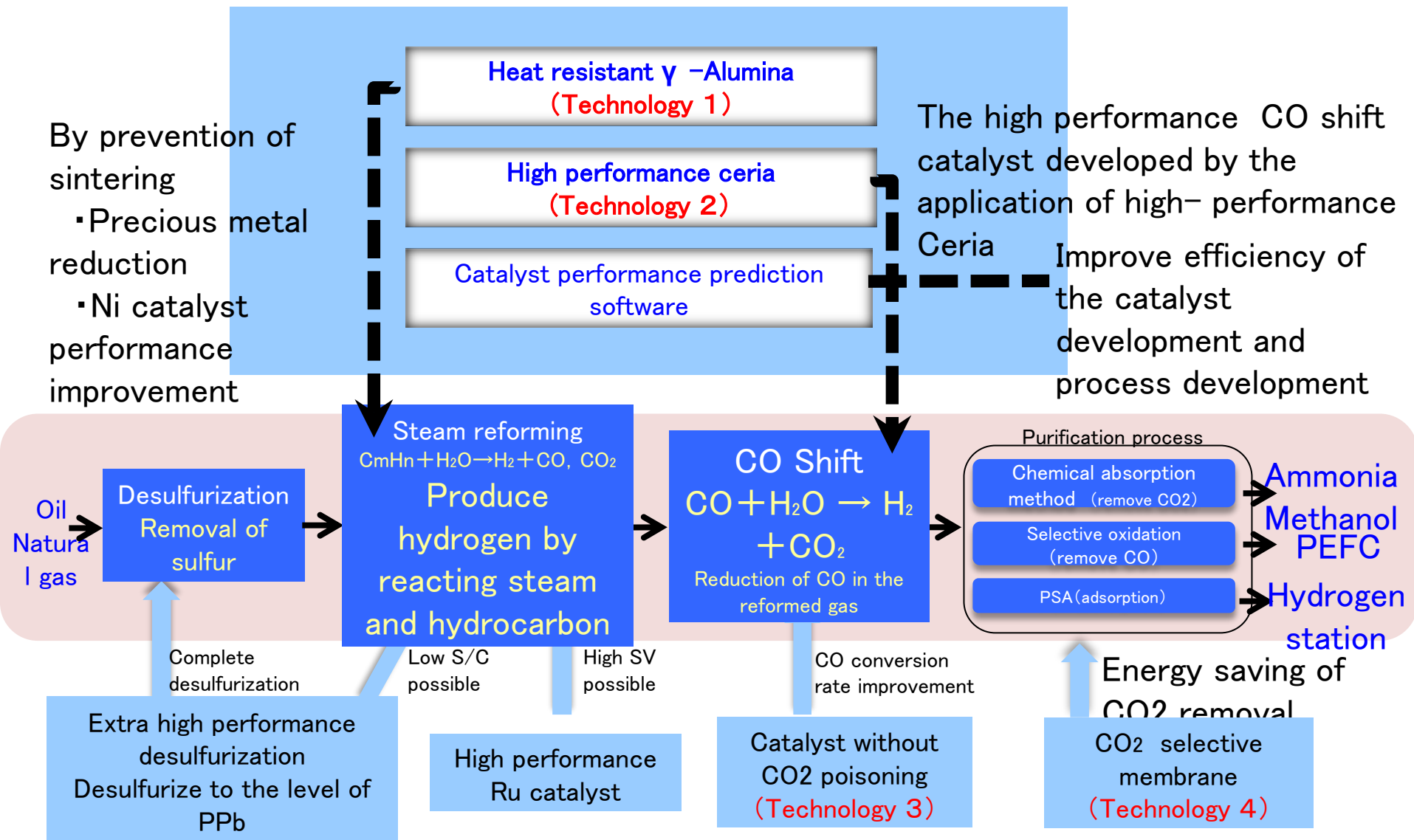
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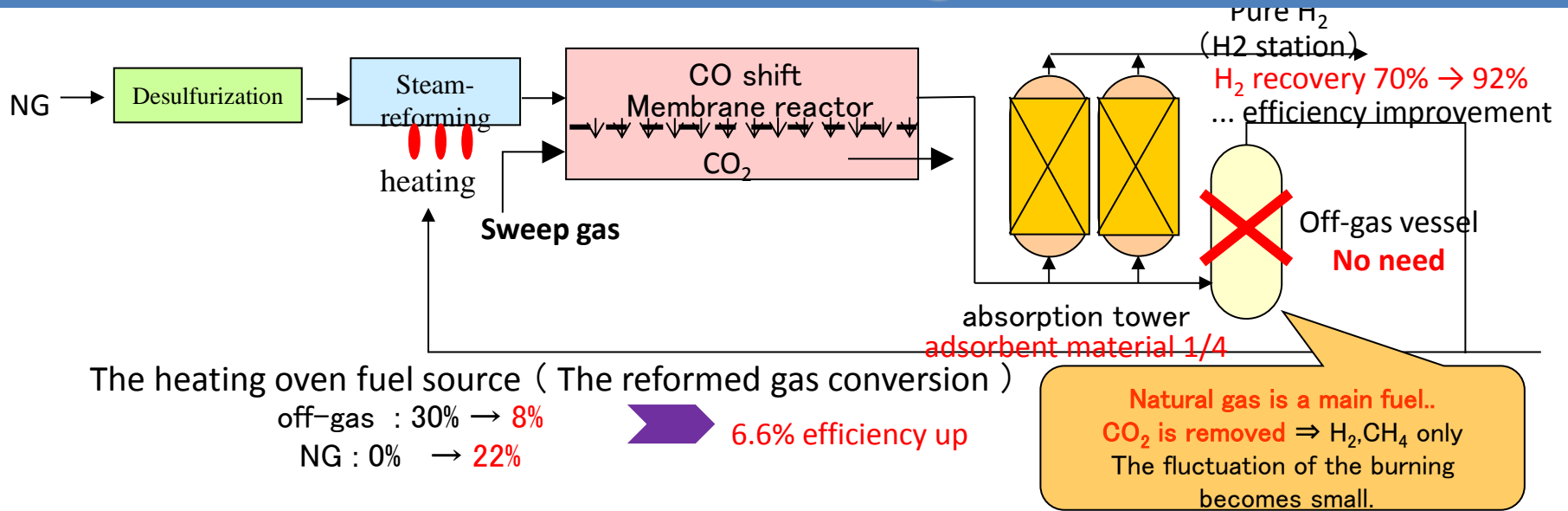
**Fresh, Aged catalysts show  
higher performance than  
the reference catalyst**

# The hydrogen production related technique which RER holds

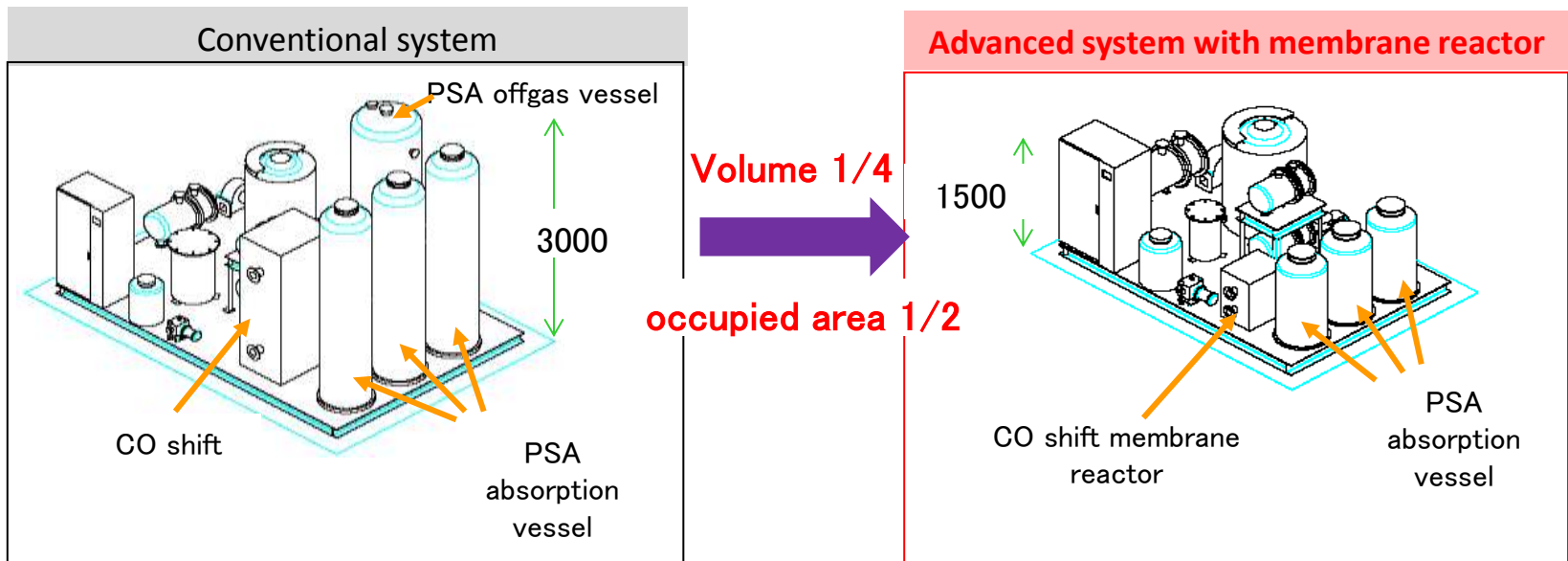
## Seeds technologies cultivated by Tohoku University and RER



# Effects of advanced technologies (Hydrogen station)



## Downsizing of Hydrogen station (300Nm<sup>3</sup>/h)



# Conclusion

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Innovative materials we developed

1. Heat-resistant  $\gamma$ -alumina
2. High Performance Ceria

can realize

Next generation hydrogen production process