

cooling to room temperature, the fin is cleaned in 20 wt. % HNO₃ solution for 20 min with sonication. The fin is rinsed with deionized water until the pH value is 7. After drying at 120° C. for 1 hour, the fin is heated to 1000° C. in air at a heating rate of 3.5° C./min and calcined at 1000° C. for 8 hours in air. The Al₂O₃ slurry is washcoated onto the fin by dipping. The excess slurry is removed by jetting air over the coated surface. The fin is dried at 120° C. for 1 hour and then calcined at 450° C. for 4 hours at a heating and cooling rate of 3.5° C./min. A 7.5 wt. % La(NO₃)₃ solution is impregnated onto the slurry-coated fin by dipping. The fin is dried at 120° C. for 1 hour and calcined at 1000° C. for 4 hours in air at a heating and cooling rate of 3.5° C./min. The slurry loading is 6.0 mg per fin. A 10 wt.% Rh(NO₃)₃ solution is dropped onto the fin and the excess solution is blown out by compressed air. The fin is dried at 120° C. for 1 hour and then calcined at 1000° C. for 1 hour in air. The Rh loading is 1.0 mg per fin.

[0138] The resulting fin supported catalyst is tested for partial oxidation of methane to syngas at 1 atmosphere in the pellet described in Example 2. The pellet is placed in a furnace. The temperature of the furnace is adjusted to keep the pellet skin temperature at mid-length at 805° C. The temperature of the feed stream at the inlet of furnace is at room temperature. The feed stream is preheated before entering the pellet. The length of tubing from the entrance of furnace to the pellet is 10 feet. The outlet pressure of the product stream is atmospheric pressure. The pressure drop in the pellet is the difference between the inlet and the outlet pressures. The composition of product is analyzed with a two-column Gas Chromatograph. The performance of the fin is measured in terms of CH₄ conversion, H₂ selectivity and CO selectivity. The following table summarizes catalyst performance for the fin after 115 hours of operation.

Parameter	Value
Coating Type	Powder slurry wash-coat
Fuel composition	29.6% CH ₄ , 70.4% air
Fuel contact time	3.3 ms
CH ₄ Conversion (at 850° C.)	78%
H ₂ Selectivity (at 850° C.)	93%
CO Selectivity (at 850° C.)	93%
Pressure drop	2.8 psi

EXAMPLE 4

[0139] An FeCrAlY fin is fabricated with saw-cut method and tested in a pellet for catalyst performance. The following table summarizes dimensions of the fin:

	Dimension (in)
<u>Fin Thickness</u>	
At base	0.010"
At top	0.005"
<u>Fin spacing</u>	
At base	0.017"
At top	0.022"
Fin height	0.033"
Rectangular base height	0.020"
Overall width	0.180"

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	Dimension (in)
Overall height	0.053"
Overall length	1.500"

[0140] An Al₂O₃ slurry is prepared by mixing 7.2 g of gamma Al₂O₃ powder, 12 g of deionized H₂O and 42 g Al₂O₃ beads with 3 mm diameter. The pH value was adjusted to 3.5-4 using nitric acid. The Al₂O₃ is acidic gamma Al₂O₃, is ground to powder smaller than 150 micrometers. The mixture is then ball-milled for 8 hours. 0.8 g of 25 wt. % Al₂O₃ sol (Sasol 14N4-25) is added to 4.2 g of the slurry with stirring.

[0141] The FeCrAlY fin is cleaned in iso-propanol for 20 min with sonication. After drying at 100° C. for 1 hour and cooling to room temperature, the fin is cleaned in 20 wt. % HNO₃ solution for 20 min with sonication. The fin is then rinsed with deionized water until pH value reaches 7. After drying at 120° C. for 1 hour, the fin is heated to 1000° C. in air at a heating rate of 3.5° C./min and calcined at 1000° C. for 8 hours in air. The Al₂O₃ slurry is washcoated onto the fin by dipping. The excess slurry is removed by jetting air over the coated surface. The fin is dried at 120° C. for 1 hour and then calcined at 450° C. for 4 hours at a heating and cooling rate of 3.5° C./min. 7.5 wt. % La(NO₃)₃ solution is impregnated onto the slurry-coated fin by dipping. The fin is dried at 120° C. for 1 hour and calcined at 1000° C. for 4 hours in air at a heating and cooling rate of 3.5° C./min. The slurry loading is 18.7 mg per fin. 10 wt. % Rh(NO₃)₃ solution is dropped onto the fin and the excess solution is blown out by compressed air. The fin is dried at 120° C. for 1 hour and calcined at 1000° C. for 4 hours in air. The Rh loading is 3.2 mg per fin.

[0142] The resulting fin supported catalyst is tested for partial oxidation of methane at 1 atmosphere in the pellet described in Example 2. The pellet is placed in a furnace. The catalyst is reduced with H₂ at 400° C. for 30 min before use. The feed gas compositions are 29.6% of CH₄ and 70.4% of air (CH₄/O₂=2/1), with 2372 ml/min of total flow rate (standard conditions). The contact time is 3.3. The temperature of the furnace is adjusted to keep the pellet skin temperature at mid-length at 850° C. The temperature of the feed stream at the inlet of furnace is at room temperature. The feed stream is preheated before entering pellet. The length of tubing from the entrance of furnace to the pellet is 10 feet. The outlet pressure of the product stream is atmospheric pressure. The pressure drop in the pellet is measured by a capsuhelic differential pressure gauge. The composition of product is analyzed with a two-column Gas Chromatograph. The performance of the fin is measured in terms of CH₄ conversion, H₂ selectivity and CO selectivity. The following table summarizes the fin supported catalyst performance after 400 hours of operation.

Parameter	Value
Coating Type	Powder slurry wash-coat
Fuel composition	29.6% CH ₄ , 70.4% air