

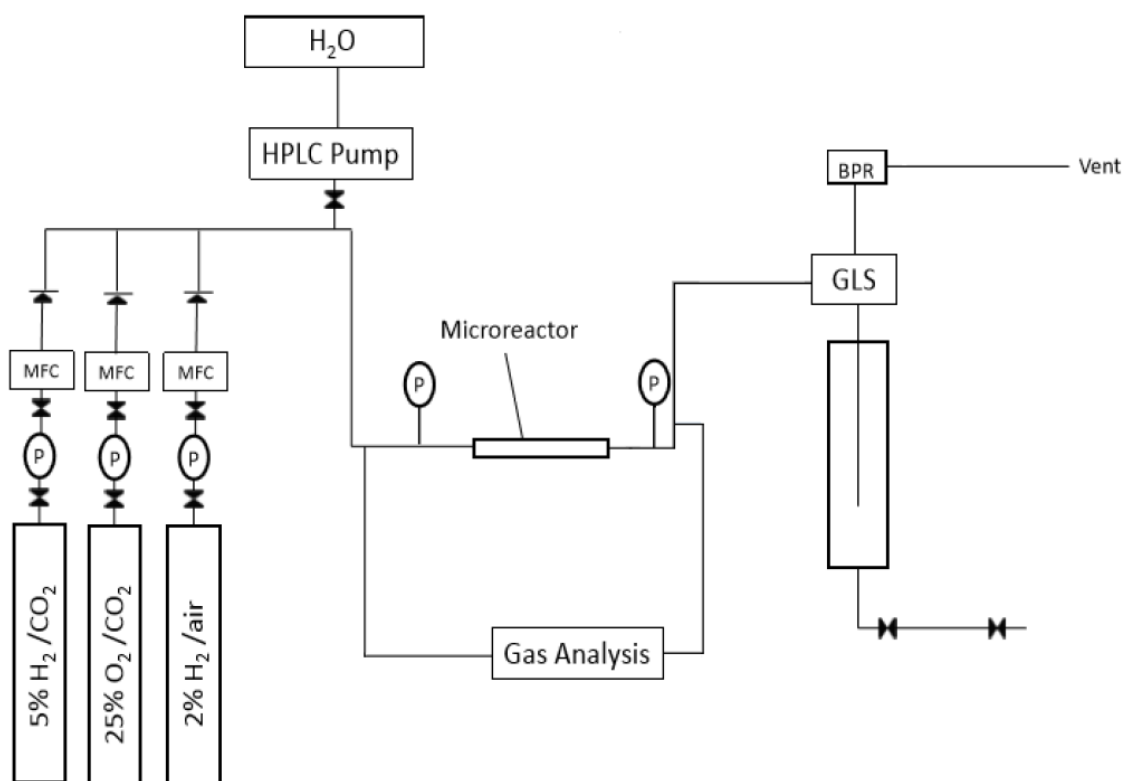
The Direct Synthesis of Hydrogen Peroxide from H₂ and O₂ Using Pd-Ni/TiO₂ Catalysts.

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Supplementary Figure 1: Schematic of flow reactor. P = pressure gauge, MFC = mass flow controller, GLS = gas liquid separator, BPR = back pressure regulator.

Supplementary Table 1: Comparison of catalytic activity towards H₂O₂ synthesis and its subsequent degradation, under batch conditions.

Catalyst	H ₂ O ₂ Concentration / ppm	Degradation / %	H ₂ Selectivity / %
0.5%Pd/TiO ₂	133	10	75
0.5%Pd-4.5%Ni/TiO ₂	152	0	97
4.5%Ni/TiO ₂	0	0	-

H₂O₂ direct synthesis reaction conditions: catalyst (0.01 g), H₂O (8.5 g), 5% H₂/CO₂ (420 psi), 25% O₂/CO₂ (160 psi), 0.5 h, 20 °C, 1200 rpm. H₂O₂ degradation reaction conditions: catalyst (0.01 g), H₂O₂ (50 wt. %, 0.68 g), H₂O (7.82 g), 5% H₂/CO₂ (420 psi), 0.5 h, 20 °C, 1200 rpm.

Supplementary Table 2: Leaching of Pd and Sn in 0.5% Pd-4.5% Sn / TiO₂(ORO) catalyst observed via MP-AES over 10 h on-stream in flow reactor.

Time on-stream / h	Leaching of metal from 0.5% Pd-4.5% Sn / TiO ₂ (ORO)	
	Loss of Pd / %	Loss of Sn / %
0.25	B.D.L	B.D.L
0.5	B.D.L	B.D.L
1	B.D.L	B.D.L
2	B.D.L	B.D.L
4	B.D.L	B.D.L
6	B.D.L	B.D.L
8	B.D.L	B.D.L
10	B.D.L	B.D.L

B.D.L: Below Detection Limit.

Reaction conditions: 20 °C, catalyst mass (0.25 g) H₂O liquid flow rate, 1 mLmin⁻¹, 30 bar total pressure, 5%H₂/CO₂ (175 mLmin⁻¹), 25% O₂/CO₂ (35 mLmin⁻¹).