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Supporting Information

Energy-Efficient Small-Scale Ammonia Synthesis Process with Plasma-enabled Nitrogen Oxidation and Catalytic Reduction of Adsorbed NO_x

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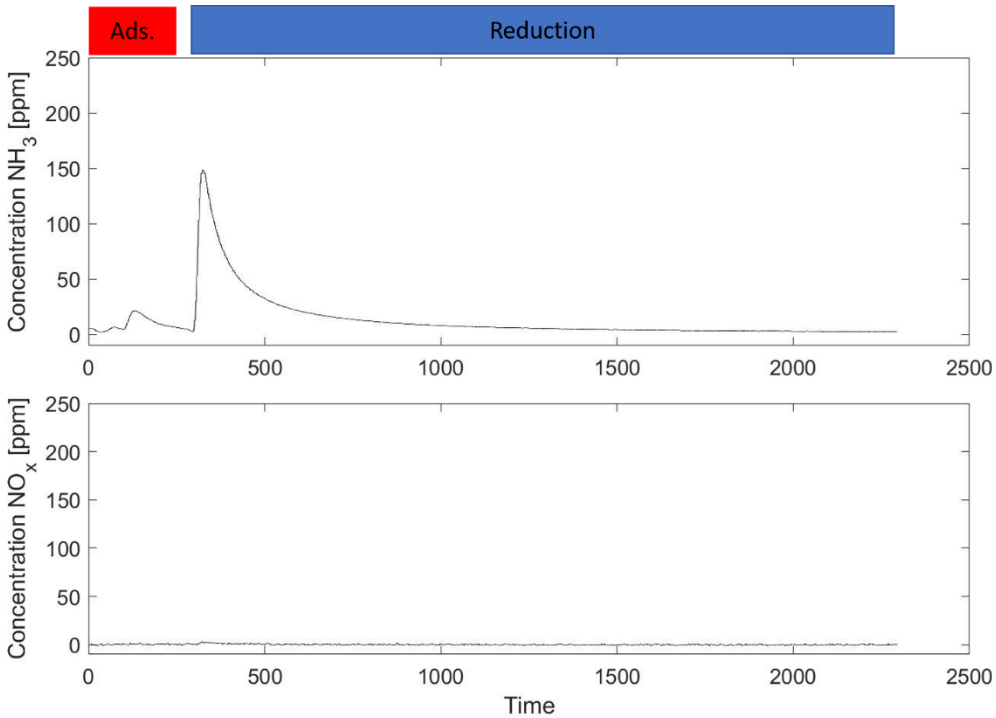

Figure S1. *Outlet concentration of NH_3 and NO_x during an adsorption-reduction cycle at 175 °C. Adsorption phase was executed with a gas mixture composed of 200 ppm NO, 20 % O_2 and 80 % N_2, reduction phase with a gas mixture composed of 1000 ppm H_2 in N_2. NH_3 selectivity = 68 %*

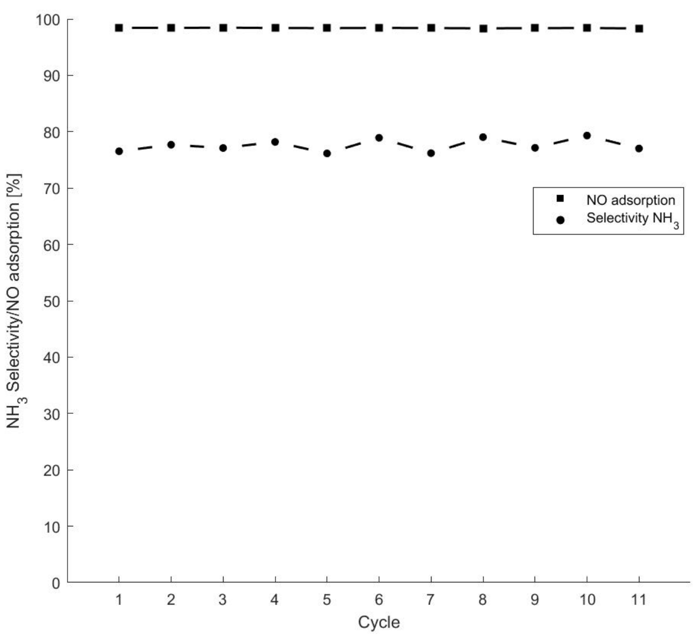

Figure S2. *Stability of the LNT catalyst during 11 consecutive adsorption/reduction cycles at 175°C. Adsorption phase was executed with a gas mixture composed of 200 ppm NO, 20 % O_2 and 80 % N_2, reduction phase with a gas mixture composed of 5% H_2 and 95 % N_2.*

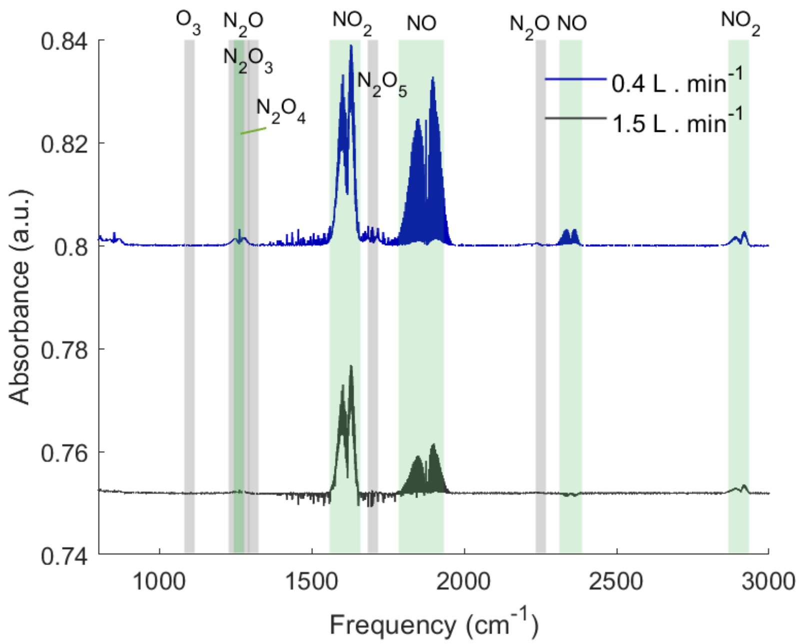

Figure S3*. The FTIR spectra after the plasma for the highest concentration (blue; 0.4 L/min) and the lowest energy consumption (black; 1.5 L/min). The peak regions of the detected species are annotated in green (NO, NO_2, N_2O_4), and the absent species in grey (O_3, N_2O, N_2O_5, N_2O_3).*

__Table S1__. Overview of the best performing small-scale processes for decentralized NH_3 production

Small-scale NH_3 synthesis concepts					
	Yield	**NH_3 selectivity**	**Energy cost**	**Max. NH_3 conc.**	**Ref.**
Plasma NO_x + catalytic reduction	Plasma: 1 mmol/h LNT: 10.2 $mmol/h.g_{Pt}$ 0.077 $mmol/h.g_{LNT}$	Selectivity = 83 %	2.1 MJ/mol NH_3 *	240 ppm	This work
Electrochemical N_2 reduction with Li-cycling	0.19 mmol/cm².h	FE = 69 %	2.9 MJ/mol NH_3 *	/	1
Electrochemical N_2 reduction with Li-cycling	0.11 mmol/cm².h	FE = 35 %	12.4 MJ/mol NH_3	77 ppm	2
Plasma NO_3^- + Electrochemical reduction	Plasma: 0.8 mmol/h Elec.: 0.15 mmol/h.cm²	FE =~100 %	15.5 MJ/mol NH_3	60 ppm	3
Plasma NO_3^- + Electrochemical reduction	Plasma: 1.35 mmol/h Elec.: 0.11 mmol/h.cm²	FE = 95.8 % Selectivity = 81.2 %	/	75 ppm	4
Direct Plasma NH_3	4 mmol/h	Selectivity = ~ 100 %	19.1 MJ/mol NH_3 *	1.75 %	5

*Assuming H_2 is produced at an energy efficiency of 70 %

__Table S2__. Comparison of our $Pt/BaO/Al_2O_3$ Lean NO_x Trap (heterogeneous catalyst) with state of the art electrocatalysts for reduction of nitrate ions to NH_3

Conversion of oxidized nitrogen (NO_x/NO_3^-) to NH_3				
	Catalyst	**NH_3 yield**	**NH_3 selectivity**	**Ref.**
Catalytic NO_x reduction	$Pt/BaO/Al_2O_3$ Lean NO_x Trap	0.077 $mmol/h.g_{LNT}$ 10.2 $mmol/h.g_{Pt}$	Selectivity = 83 %	This work
Electrochemical nitrate reduction	Cu nanowires	0.15 mmol/h.cm²	FE = ~ 100 %	3
	Pd/TiO_2	0.16 mmol/h.cm²	FE = 92.1 %	6
	Single atom Fe	0.075 mmol/h.cm²	FE = ~ 100 %	7
	Single atom Fe	0.44 mmol/h.cm²	FE = 75 %	8
	Ni/B	0.11 mmol/h.cm²	FE = 98.7 %	4
	Cu/Cu_2O nanowires	0.24 mmol/h.cm²	FE = 95.8 % Selectivity = 81.2 %	9

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