High resolution SEM and EDX characterization of deposits formed by CH4+Ar DBD plasma processing in a packed bed reactor

Mohammadreza Taheraslani[1,2*] and Han Gardeniers[1]

1. Mesoscale Chemical Systems, MESA+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands.
2. Faculty of Science and Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands.

*Correspondence: m.taheraslani@utwente.nl

Supplementary Information

Table S1. The conversion of CH_4 and the selectivity of gas-phase (C_{2+}) products and deposits for the non-packed (Blank) and the packed DBD plasma reactor. Total flow rate=50 ml/min, CH_4 concentration=5 %vol CH_4, Voltage = 7-8 kV, f = 23 kHz, P = 7-8 W.

Experiment	CH4 Conversion %	C2+ Selectivity %	Deposits Selectivity %
Blank	39.2	49.7	50.3
γ-alumina	47.7	38.8	61.2
Pd/γ-alumina	32.8	75.8	24.2
BaTiO3	9.3	76.4	23.6
MgO/Al2O3	35.5	42.1	57.9
Silica-SBA-15	33.4	49.4	50.6
α-alumina	46.7	37.8	62.2

$$\text{Conversion of } CH_4\ (\%) = \frac{CH_4 \text{ converted (mmol/s)}}{CH_4 \text{ introduced (mmol/s)}} \times 100$$

$$\text{Selectivity of } C_{2+} \text{ gas-phase products } (\%) = \frac{\sum C_xH_y \text{ produced (mmol/s)} \times x}{CH_4 \text{ converted (mmol/s)}} \times 100$$

$$\text{Selectivity of the formed deposits } (\%) = \frac{CH_4 \text{ converted (mmol/s)} - CH_4 \text{ consumed to form gas-phase products (mmol/s)}}{CH_4 \text{ converted (mmol/s)}} \times 100$$