Supplemental material

Shock-tube study of the decomposition of tetramethylsilane using gas chromatography and high-repetition-rate time-of-flight mass spectrometry

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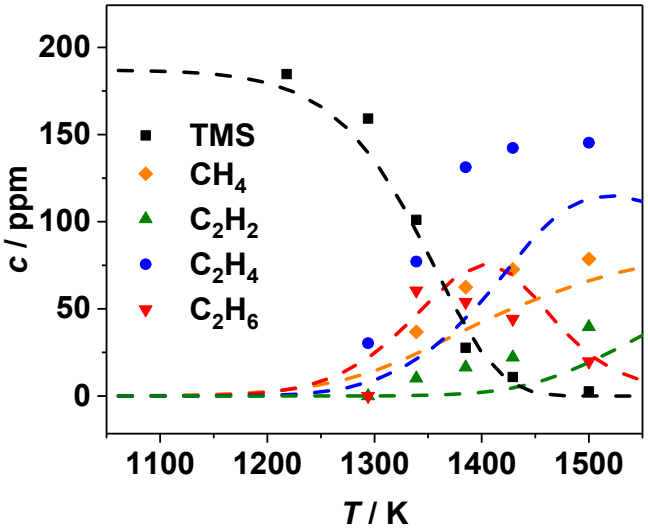
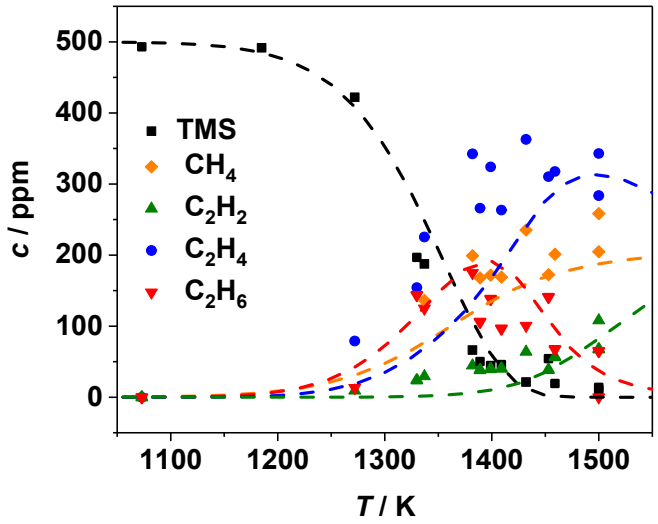
Concentration profiles simulated with the hydrocarbon chemistry module from Healy *et al.*[1].

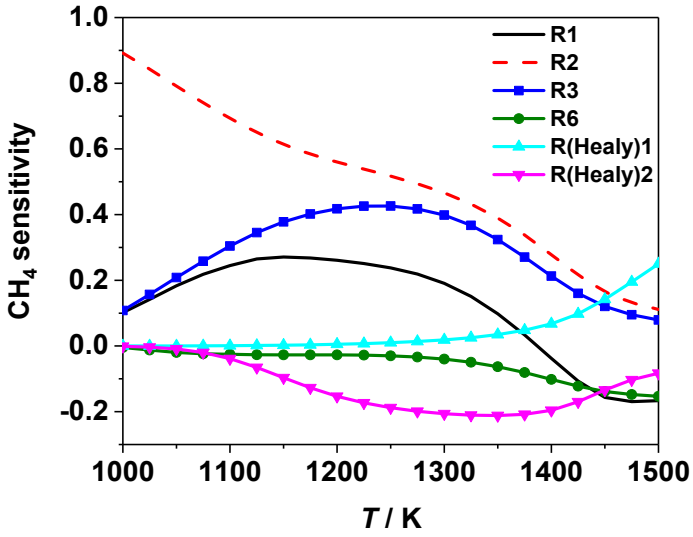


S1: Comparison of the measured and simulated (hydrocarbon chemistry module from Healy et al.[1]) concentration profiles as a function of the temperature for 200 ppm TMS, 400 ppm Kr in Ar. Measured: TMS, CH_4, C_2H_2, C_2H_4, *and* C_2H_6; simulated: TMS, C_2H_2, C_2H_4, and C_2H_6.

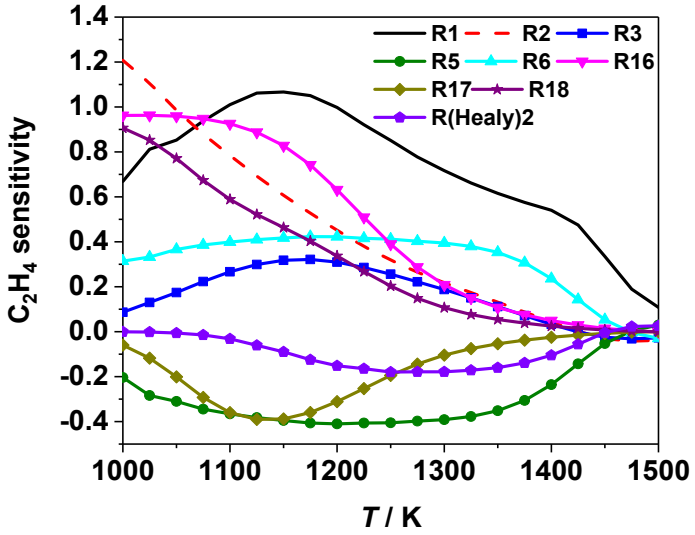


S2: Comparison of the measured and simulated (hydrocarbon chemistry module from Healy et al.[1]) concentration profiles as a function of the temperature. Measured: TMS, CH_4, C_2H_2, C_2H_4, and C_2H_6; simulated: TMS, CH_4, C_2H_2, C_2H_4, and C_2H_6 for 500 ppm TMS, 500 ppm Kr in Ar.

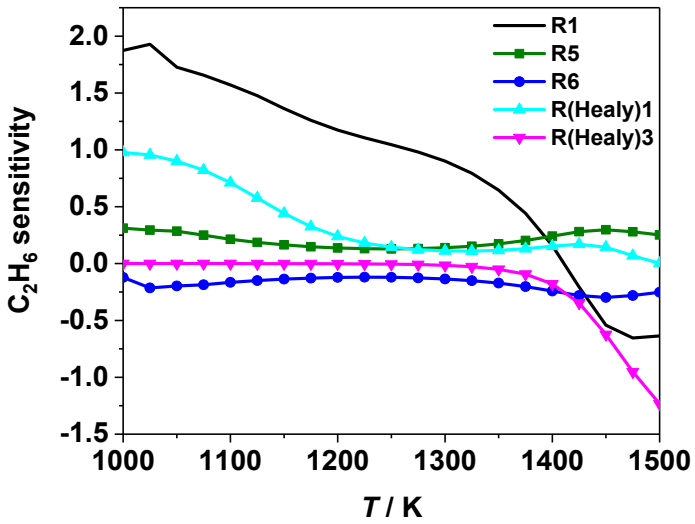
Local sensitivity analysis for CH_4, C_2H_4 and C_2H_6 with the hydrocarbon chemistry module from Healy *et al.*[1] for 500 ppm TMS + 500 ppm Kr in Ar.



S3: Local sensitivity analysis for CH_4 for an initial concentration of 500 ppm TMS in Ar. The figure shows the reactions with the largest impact on CH_4 concentration. The reactions R1, R2, R5, and R6 are listed in Table 2 of the main document and R(Healy)1: $CH_3 + H + M \leftrightarrow CH_4 + M$ and R(Healy)2: $CH_3 + CH_3 + M \leftrightarrow C_2H_6 + M$ are reactions from the Healy mechanism[1].

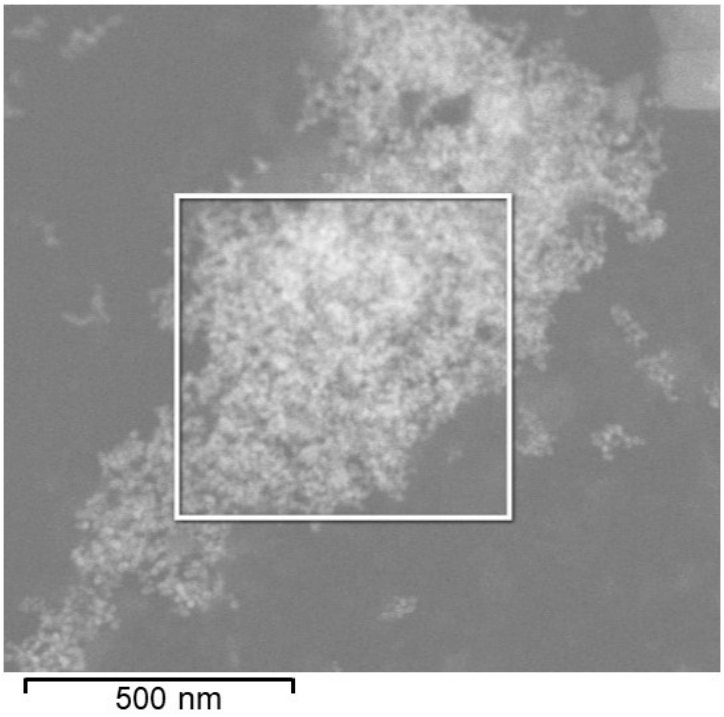


S4: Local sensitivity analysis for C_2H_4 for an initial concentration of 500 ppm TMS in Ar. The figure shows the reactions with the largest impact on C_2H_4 concentration. The reactions R1, R2, R5, R6, R12, R13 and R16 are listed in Table 2 of the main document and R(Healy)2: $CH_3 + CH_3 + M \leftrightarrow C_2H_6 + M$ is a reaction from the Healy mechanism[1].

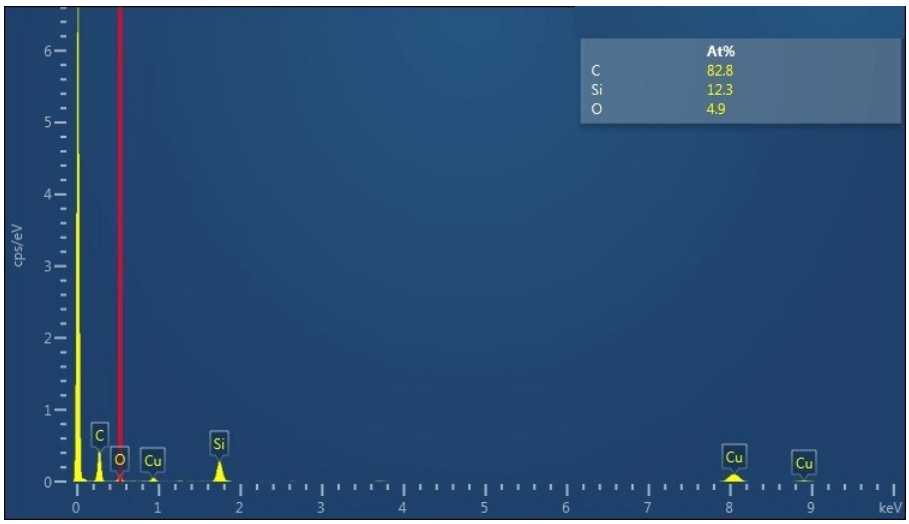


S5: Local sensitivity analysis for C_2H_6 for an initial concentration of 500 ppm TMS in Ar. The figure shows the reactions with the largest impact on C_2H_6 concentration. The reactions R1, R5 and R6 are listed in Table 2 of the main document and R(Healy)1: $CH_3 + H + M \leftrightarrow CH_4 + M$ and R(Healy)3: $C_2H_6 + H \rightarrow C_2H_5 + H_2$ are reactions from the Healy mechanism[1].

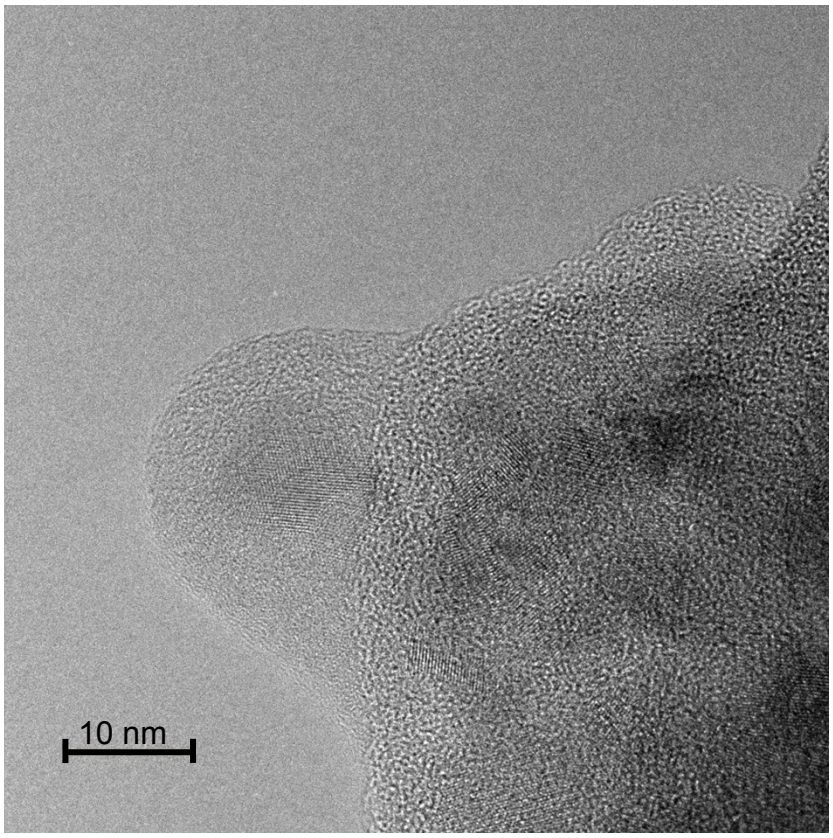
Transmission electron microscopy (TEM) and energy dispersive X-ray spectroscopy (EDX) measurements of the produced particles inside the shock tube.



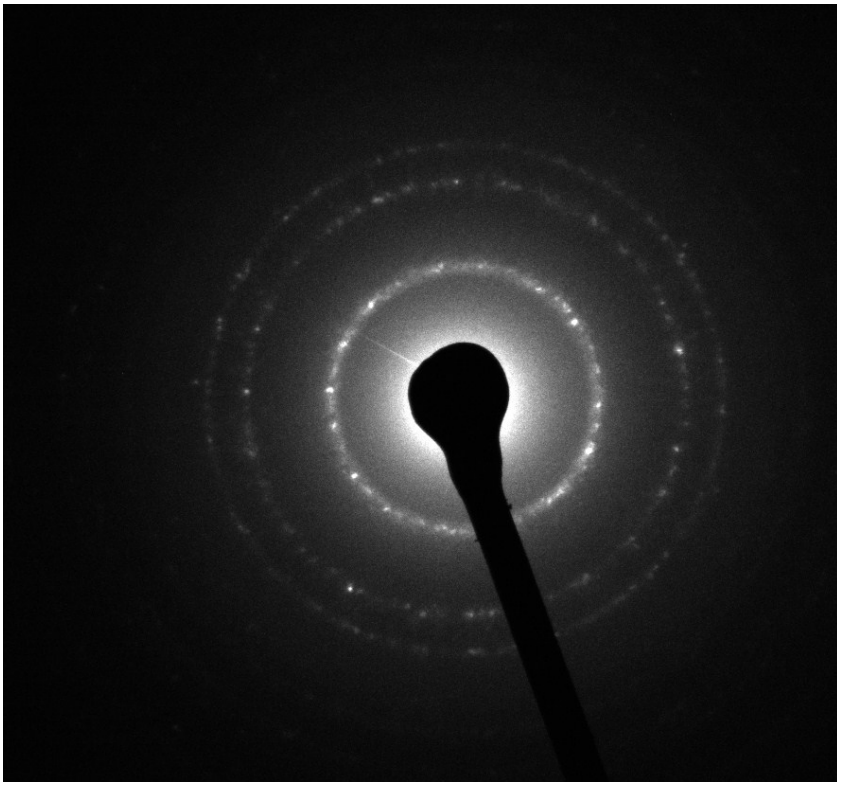
S6: Scanning electron microscopic (SEM) image of the produced brownish solid. The figure shows the region that was chosen for element distribution measurements (Figure S7) via energy-dispersive X-ray spectroscopy (EDX).



S7: Element distribution of the produced brownish solid with a composition of 83% carbon and 12% silicon.



S8: TEM image showing the crystalline structure of the deposit close to the end wall (magnification: 300.000).



S9: Diffraction image taken with TEM in diffraction mode. The diffraction pattern corresponds to the crystal structure documented for SiC [2].

Reference

1. D. Healy, N. S. Donato, C. J. Aul, E. L. Petersen, C. M. Zinner, G. Bourque and H. J. Curran, *Combustion and Flame*, 2010, **157**, 1526-1539.

2. Braekken, H., *Zeitschrift fuer Kristallographie, Kristallgeometrie, Kristallphysik, Kristallchemie* (-144,1977), 1930, **75**, 572-573