Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

A design of a fixed bed plasma DRIFTS cell for studying the NTP-assisted heterogeneously catalysed reactions

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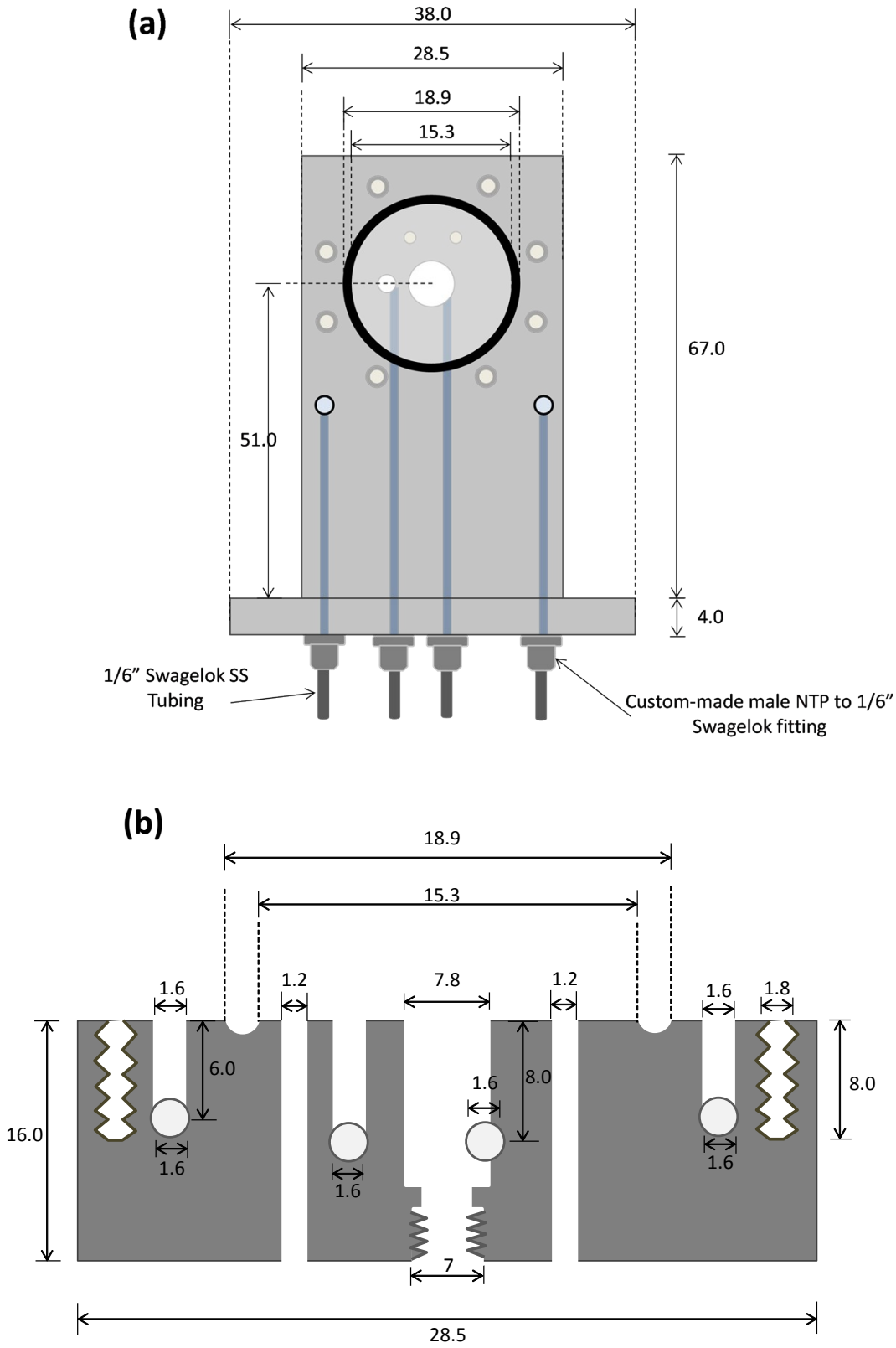

Figure S1 Schematic sketches of plug flow plasma DRIFTS cell with dimension (not to scale) showing a top view (a) and a front view (b) of a polyether ether ketone (PEEK) base. All units are millimetre.

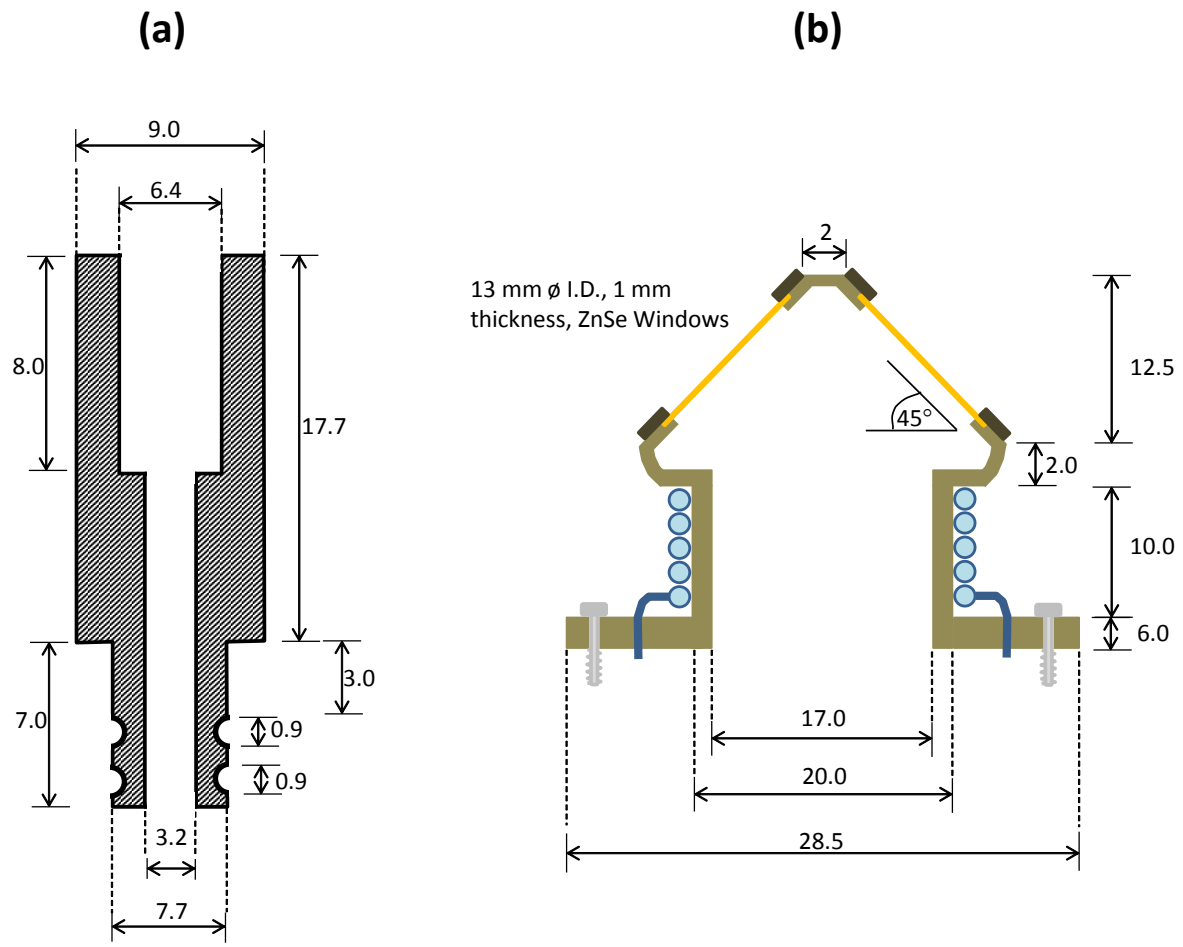

Figure S2 Schematic sketches of polytetrafluoroethylene (PTFE) crucible (a) and poly(methyl methacrylate, perspex) dome (b) of plug flow plasma DRIFTS cell with dimension (not to scale). All units are millimetre.

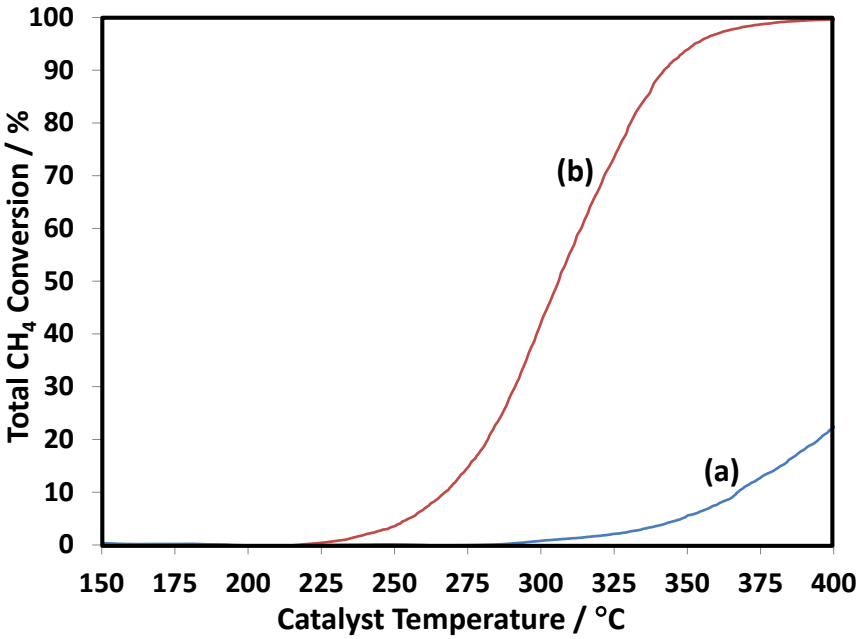

Figure S3 CH_4 conversion as a function of reaction temperature over Al_2O_3 (a) and 2% Pd/Al_2O_3 (b) under 0.5% CH_4 + 10% O_2 reaction conditions using a quartz plug flow reactor (10 °C/min ramp rate).

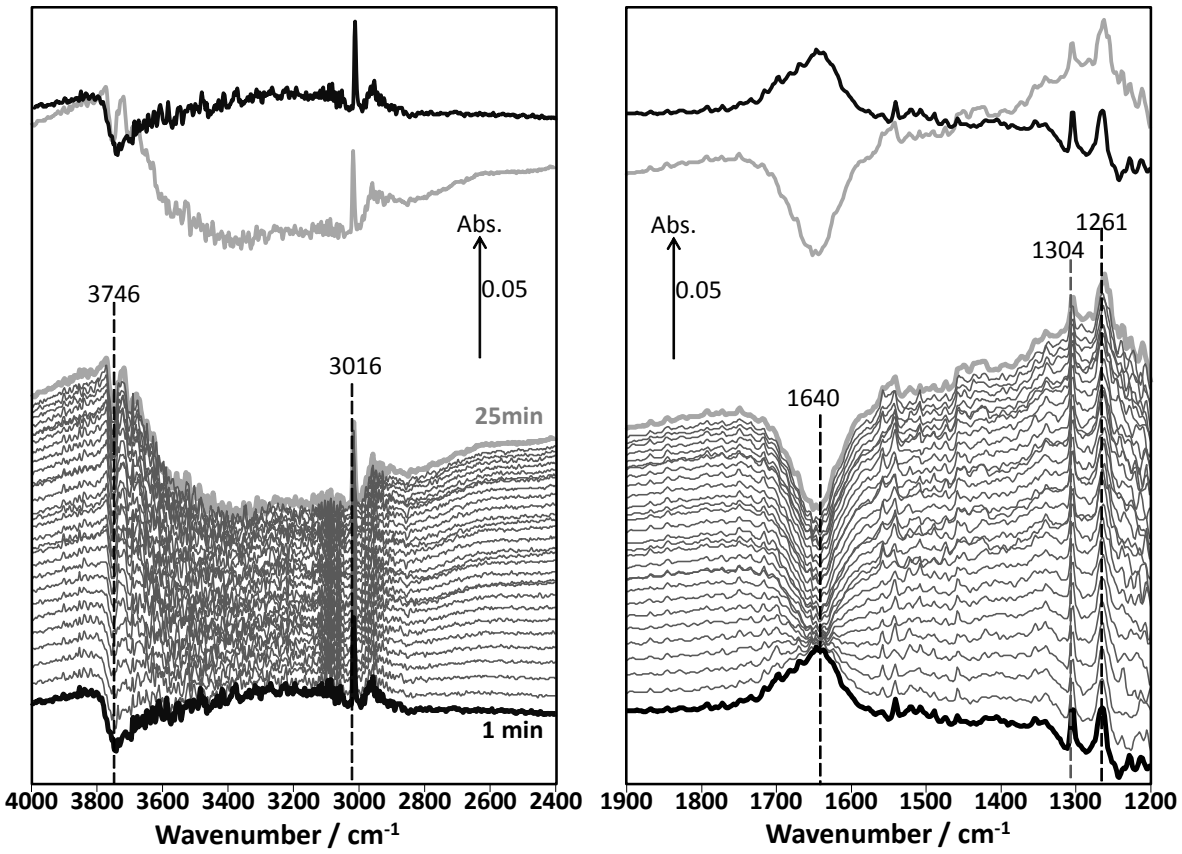

Figure S4 *In-situ* DRIFT spectra recorded as a function of time on stream during NTP-assisted CH_4 oxidation reaction with the plasma voltage of **5** kV applied to over **Al_2O_3** support from 1 (bold black) to 25 min (bold grey) under 0.5% CH_4 + 10% O_2 reaction conditions.

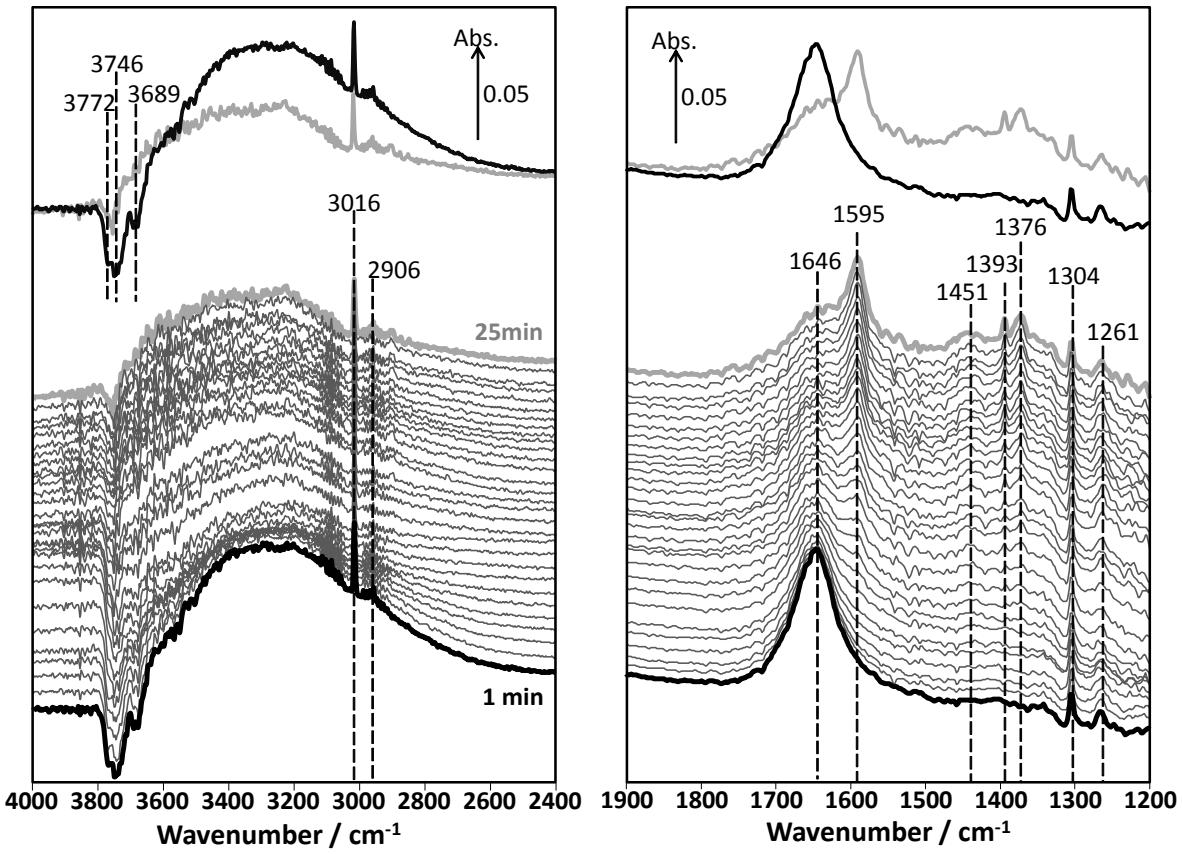

Figure S5 *In-situ* DRIFT spectra recorded as a function of time on stream during NTP-assisted CH_4 oxidation reaction with the plasma voltage of **5** kV applied to over **2% Pd/Al_2O_3** catalyst from 1 (bold black) to 25 min (bold grey) under 0.5% CH_4 + 10% O_2 reaction conditions.

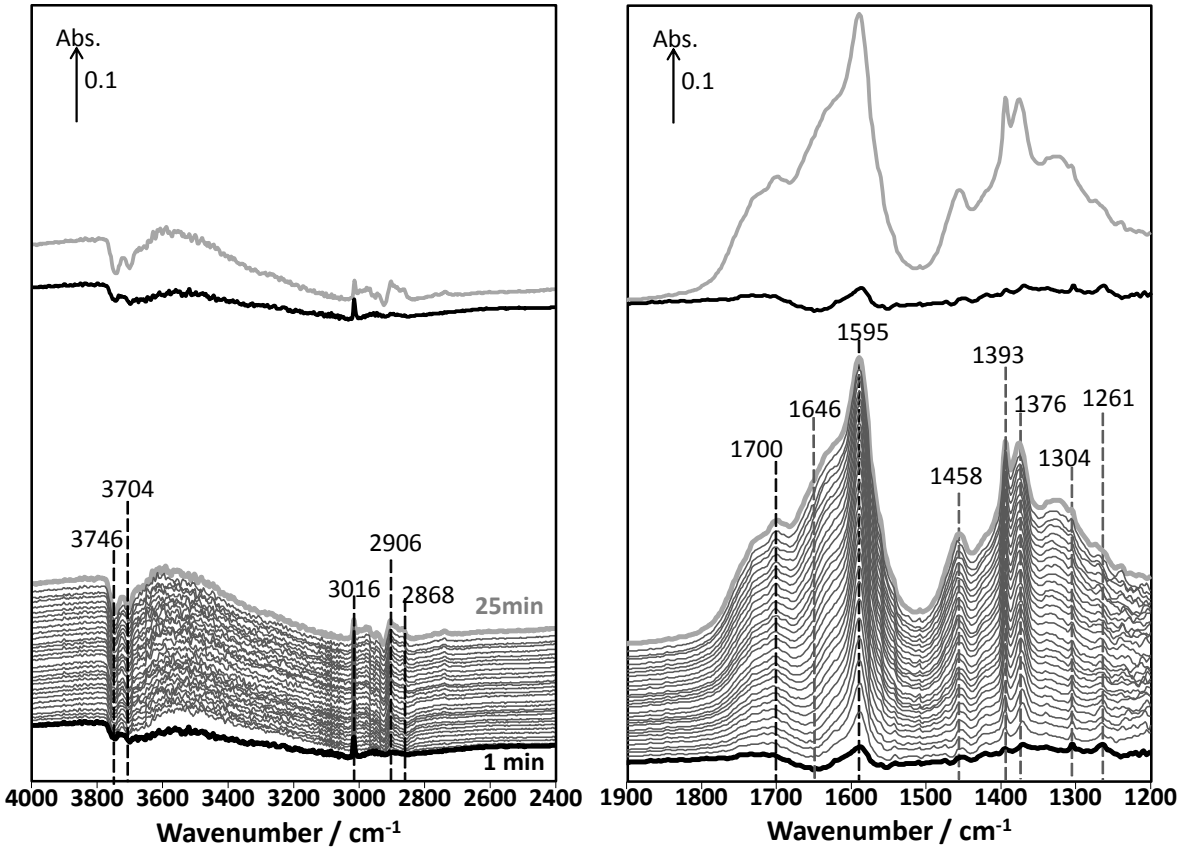

Figure S6 *In-situ* DRIFT spectra recorded as a function of time on stream during NTP-assisted CH_4 oxidation reaction with the plasma voltage of **6** kV applied to over **Al_2O_3** support from 1 (bold black) to 25 min (bold grey) under 0.5% CH_4 + 10% O_2 reaction conditions.

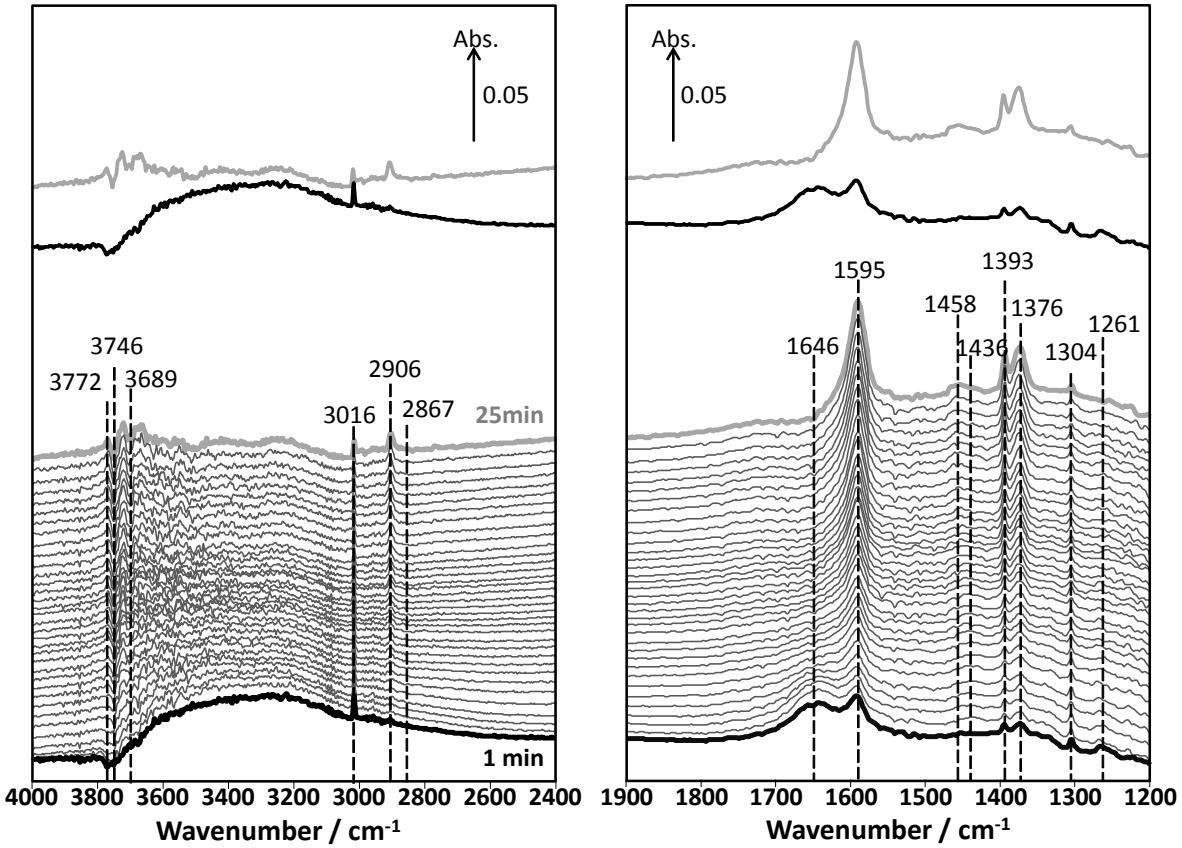

Figure S7 *In-situ* DRIFT spectra recorded as a function of time on stream during NTP-assisted CH_4 oxidation reaction with the plasma voltage of **6** kV applied to over **2% Pd/Al_2O_3** catalyst from 1 (bold black) to 25 min (bold grey) under 0.5% CH_4 + 10% O_2 reaction conditions.