

Abstract Submitted
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On multiple component detection in molecular plasmas using cw external-cavity quantum cascade infrared lasers DMITRY LOPATIK, NORBERT LANG, UWE MACHERIUS, HENRIK ZIMMERMANN, JUERGEN ROEPCKE, INP Greifswald, Greifswald, Germany — Several cw external cavity quantum cascade lasers (EC-QCLs) have been tested as radiation sources for an absorption spectrometer focused on the analysis of molecular plasmas. Based on the wide spectral tunability of EC-QCLs multiple species detection is demonstrated in low pressure Ar/N₂ MW plasmas containing CH₄ as hydrocarbon precursor. Using the direct absorption technique the evolution of the concentrations of CH₄, C₂H₂, HCN and H₂O has been monitored depending on the discharge conditions (p= 0.5 mbar, f= 2.45 GHz) in a planar MW plasma reactor. The concentrations were found to be in the range of 10¹¹ – 10¹⁴ molecules cm⁻³. Based on the profiles of absorption lines the gas temperature T_g has been calculated in dependence on the discharge power. Changing the discharge power from 0.2 kW to 1 kW leads to an increase of T_g from 400 to 700 K. The typical spectral line width of the EC-QCLs under the study was about 30 MHz. Varying the power values of an EC-QCL for direct absorption measurements at low pressure conditions no saturation effects in determining the concentrations of CH₄ and C₂H₂ could be found under the used conditions.

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