Abstract: The dielectric barrier discharge - a powerful microchip plasma for analytical spectrometry

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The dielectric barrier discharge plasma is presented as a powerful microchip source for analytical spectrometry. The dielectric barrier discharge is characterized by small size, low electric power (< 1 Watt), low gas temperature (about 600K) and excellent dissociation capability for molecular species, such as CCl_2F_2, $CClF_3$ and $CHClF_2$. Time dependent and spatially resolved measurements show the development of the gas temperature and the electron density in connection with the dissociation of molecular species. It has been used here in plasma modulation diode laser absorption spectrometry of excited chlorine and fluorine in noble gases as well as in air/noble gas mixtures. Furthermore emission measurements with an Echelle Spectrometer were performed. The analytical figures of merit of diode laser absorption spectrometry obtained with the dielectric barrier discharge are comparable with the results found earlier with dc and microwave induced plasmas of larger size and much higher plasma powers. Detection limits of plasma modulation diode laser absorption spectrometry of 400 ppt and 2 ppb for CCl_2F_2 in He were found using the Cl 837 nm and the F 685 nm line, respectively.