## Paper EM+AP+MS+NS+TF-ThM1 **High-density Plasma for Soft Etching of Noble Metals**

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During our research to define a contact which can be serve as thin hard mask in III/V semiconductor processing, we focused on the Bell contact which consists of Ti/Pt(Mo)/Au and chlorine-based plasmas generated by electron cyclotron resonance. For platinum, we identified PF<sub>3</sub> as main component which acts comparable to CO

[1]. This fact triggered our search for suited etchants for gold and copper. For Au, the best ambient is a mixture of CH<sub>4</sub>, Cl<sub>2</sub>, and O<sub>2</sub> which is stabilized by Ar [2]. This

mixture generates residual-free etching of metal films which are clearly free of "fencing" and "hear's ears."

The etching process has been established up to thicknesses of half a micron which is the typical thickness of metal films on the p-side of laser devices. With the aid of optical emission spectroscopy, the generation of CO could be proven [3]. This reagent seems to be the main component for real etching without residual fencing.

[1] G. Franz, R. Kachel, and St. Sotier, Mat. Sci. Semicond. Proc. 5, 45 (2002)

[2] G. Franz, R. Meyer, and M.-C. Amann, Plasma Sci. Technol. 19, 125503 (2017)

[3] G. Franz, W. Oberhausen, R. Meyer, and M.-C. Amann, AIP Advances 8, 075026 (2018)