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Study of DC and impulse discharges at sub-micrometer gap distances in various gases NATHAN NGOUOTO, OLIVIER LESAINT, NELLY BONIFACI, OLIVIER GALLOT-LAVALLEE, Univ. Grenoble - Alpes, CNRS, Grenoble INP, G2Elab, F-38000, NAWRES SRIDI-CONVERS, Safran Electronics Defense, CHRISTOPHE POULAIN, CEA LETI, THESE CIFRE COLLABORATION — Using a point to plane electrode system and high precision positioning system, gap distances down to 100 nm are obtained. An hermetic enclosure allows to control the gas nature and pressure during breakdown experiments. A 1 mA current criterion is used to determine the breakdown voltage. Discharges can occur in various gases below 300 V in sub-micrometer gaps. This study enables to compare breakdown voltage under DC and impulse discharges, versus pressure and distance in various gases (dry air, N2, Ar, He). Time delay to breakdown are also obtained under fast impulse. At the shortest gaps, breakdown discharges occur at voltage lower than 100V, strongly departing from the Paschen curve. Results are discussed in terms of classical gas discharge mechanisms, modified by Fowler-Nordheim electron emission.

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