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Influence of the gap size and dielectric constant of the packing on the plasma discharge in a packed bed dielectric barrier discharge reactor: a fluid modeling study KOEN VAN LAER, ANNEMIE BOGAERTS, Plasmant, University of Antwerp — Packed bed dielectric barrier discharge (DBD) reactors have proven to be very useful sources of non-thermal plasma for a wide range of applications, of which the environmental applications have received most attention in recent years. Compared to an empty DBD reactor, a packing was introduced to either enhance the energy efficiency of the process, or, if the packing is catalytically active, steer the process towards a preferred end product. A wide range of geometries, bead sizes and bead materials have been tested experimentally in the past. However, since experimental diagnostics become more difficult with a packing present, a computational study is proposed to gain more insight. Using COMSOL's built in plasma module, a 2D axisymmetric fluid model is developed to study the influence of the gap size and the dielectric constant (ε) of the packing. Helium is used as discharge gas, at atmospheric pressure and room temperature. By decreasing the gas gap, the electric field strength is enhanced, resulting in a higher number of current peaks per half cycle of applied rf potential. Increasing ε also enhances the electric field strength. However, after a certain ε, its influence saturates. The electric field strength will no longer increase, leaving the discharge behavior unchanged.

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