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Modeling of nitrogen atmospheric pressure discharges

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Recently, dielectric barrier discharges at atmospheric pressure have been widely applied to ozone production, surface treatment, gas cleaning and so on. Two forms of discharges can be seen at this condition; filamentary discharges and homogeneous discharges. The former discharge form has been applied to ozone productions for years. Recently, latter form of discharge has been investigated for applying to efficient surface treatment processes. At atmospheric pressure, it is known that filamentary discharges are normally formed, however, their discharge characteristics are not clearly understood. Moreover, homogeneous barrier discharge characteristics are not known neither. The homogeneous barrier discharges are obtained in helium, nitrogen and other gases. And there are two types of discharges, Townsend discharge and glow discharge. For efficient surface treatment processes, atmospheric pressure glow discharge (APGD) in nitrogen is necessary. To investigate APGD in nitrogen, two dimensional fluid model has been developed. The discharge characteristics of high pressure barrier discharges in simple gas system have been simulated. As a result, homogeneous barrier discharges have been obtained and discharge developments are simulated clearly. Applying electric field uniformly between the gap and the slight photoionization are key points to obtain homogeneous barrier discharges. For further study, more complicated gas system will be considered in the model.