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Non-thermal atmospheric pressure plasmas have recently garnered much attention due to their unique physical and chemical properties. It can offer many possible application areas including nano and biomedical areas, and more recently, agriculture and food areas, so called 'plasma farming'. For these applications, many different types of plasma sources have been developed for specific needs, which may be one of the important merits of the atmospheric pressure plasmas because characteristics of the produced plasma depend significantly on operational parameters such as driving frequency, supply gas type, driving voltage waveform, gas flow rate, gas composition, geometrical arrangement and so on. For instance, a plasma source developer can select power sources with a wide range of choices in different frequency and waveform: AC (Hz), low frequency (kHz), radio frequency (MHz), and microwave (GHz), and various pulse types. Upon necessity, very localized jet plasmas with a single jet or jet arrays can be useful or large area plasmas can be more advantageous for some particular applications. In developing plasma sources, the following steps can be considered: i) to define the application target, ii) to define the corresponding requirements, iii) to define development direction. After design and fabrication of the specific plasma source are done, assessment of the treatment result should be performed based on diagnostics and/or monitoring of the relevant results and important species or parameters. For plasma farming applications, the requirements or the considerations of the plasma can be i) air based discharge preferred for cost effectiveness, ii) low temperature operation for heat sensitive treatment targets, iii) easy accessibility, iv) controllability, v) electrical and chemical safety, vi) no unwanted byproducts, etc. In order to understand the process and the plasma, plasma diagnostics and process monitoring are essential. In this presentation, requirements and considerations in developing plasma sources will be discussed, and several case examples of the non-thermal atmospheric pressure plasma sources recently developed in our group will be discussed.

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