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Recent Developments in Atmospheric Pressure Plasma for Gas Treatment

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Gas treatment by atmospheric pressure plasma is gaining interest because the process is environmentally friendly. Specifically, atmospheric pressure plasma features a gas ionization state that consists of energetic electrons, ions, radicals, and excited species; consequently, contaminants compounds can be destroyed under mild conditions: low temperature, fast conversion, and potential low-operating cost by atmospheric pressure. Consequently, plasma for gas conversion or purification is receiving attractive research and applications. Herein, we are summarizing our development recently in atmospheric pressure plasma for gas treatment to present how to be selected plasma systems for specific gas treatments. Particularly, gas purifications are almost required with high throughput gas volume treatment; therefore, a plasma generation in a sandwich-type honeycomb monolith catalyst is an adequate requirement with low-pressure drop, large plasma volume, and effective energy owing to primary input energy used to plasma reaction. When diluting a contaminated compound such as ethylene emission during agriculture products storage, a continuous plasma process for gas treatment results in waste energy. In contrast with an intermittent plasma-catalytic discharge, it is more suitable by temporarily capturing contaminated compounds by catalyst adsorption and then converting by the plasma-catalyst reaction. Furthermore, indirect plasma catalyst by injection method is capable to NO_x removal under a low temperature with less energy consumption. In summary, atmospheric pressure plasma systems and their application in particular cases of gas treatment are discussed.

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