# Low-temperature lightning plasma is a natural tool for cleaning air from harmful impurities

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Lightning as air cleaning system is similar to installations that clean exhaust gases from almost all organic and inorganic gaseous substances by means cold plasma (NNTP) witch formed due to a nanosecond streamer corona discharge (NSCR) [1]. The NSCR creates high concentrations of active intermediate particles, which enter into radiation-chemical reactions with contaminant molecules. Gaseous impurities are converted into environmentally friendly gases or aerosols, which are electrostatically removed from the air stream. The lightning discharge has two stages–the leader and the main one [2]. In the first stage, a NNTP is formed by streamers starting from the leader's head. An excess charge remains in the streamer zone is creating leader cover. The second stage is process of discharging cover by return streamers to the lightning channel. Thus, the NNTP is generated at both stages. Our estimates show that an air volume of $10^6$ m$^3$ is processed with one lightning flash. Due to the number of discharges, lightning branching and numerous repeated discharges, the volume of treated air can reach $10^9$ m$^3$. It is possible to significantly intensify the cleaning of the air basin by lightning generating in a thunderstorm environment due to rockets with a wire and terawatt lasers. Other way is created equipment for local atmospheric purification on base existing high-voltage installations which are capable of generating discharges several hundred meters long.

[1] Ponizovskiy A Z Gosteev S G, Kuzhel O S and Yurchenko D E 2015 *Journal of Applied Mathematics and Physics* **3** 965–973

[2] Bazelian E M Gorin B N and Levitov V I 1978 *Physical and engineering foundations of protection against lightning* (Moskow USSR: Gidrometeoizdat)