Advent of Cold Plasma

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Researchers have developed a new hand-held device that can produce room-temperature plasmas for diverse applications, most important for biomedical applications.

This new device which is a major improvement on the earlier plasma jet devices has been developed by Mounir Laroussi and XinPei Lu at the Old Dominion University in Virginia, could be used to kill bacteria, heal wounds and treat plaque.

At atmospheric pressure, most plasmas are so hot (thousands of degrees centigrade) that they would immediately kill any living cells they come into contact with. Moreover, these high-temperature plasmas are also very difficult to control. In recent years, however, researchers have developed techniques for producing low-temperature plasmas and some of these have been used in biomedical applications. However, till now the replacement were not very reliable.

A good low-temperature plasma source must be able to work at room temperature and atmospheric pressure. Moreover, it should be hand-held and must not "arc" and heat up while operating. The new device developed by Laroussi and Lu consists of two electrodes, each made of a thin copper ring attached to the surface of a glass disk: the disk is about 2.5 centimetres across and has a small hole at its centre. These electrodes are then inserted into a dielectric tube and are separated by a gap that can be varied between 0.5 and 1 centimeter.

When helium gas is injected into the tube and short (less than one

microsecond) high-voltage pulses are applied to the electrodes, a discharge is ignited in the gap between the electrodes. This produces a plasma plume that is ejected through the hole in the outer electrode. The plume can be up to 5 centimetres long, with the length depending on the flow rate of the helium and the size of the voltage pulses. The plume remains at room temperature and can be touched by bare hands.

The device is an improvement on previous plasma "jet" devices that only generate short plumes that have lengths in the millimetre range and can reach temperatures several tens of degrees above room temperature. And unlike other devices, such as the "plasma needle", the new apparatus contains no sharp metal objects. And since very short voltage pulses are used, there is no risk of arcing and heating if the device is deployed for long periods.

This development of cold plasma can have far reaching effects not only in biomedical sciences, but also in all areas where plasma are used. Its portability has added benefit. This might help the scientists and researchers use plasma in other fields.

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