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## Everlasting light

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### Energy: Researchers have developed an environmentally friendly light bulb that uses very little energy and should never need changing

ALTHOUGH it symbolises a bright idea, the traditional incandescent light bulb is a dud. It wastes huge amounts of electricity, radiating 95% of the energy it consumes as heat rather than light. Its life is also relatively short, culminating in a dull pop as its filament fractures. Now a team of researchers has devised a light bulb that is not only much more energy-efficient—it is also expected to last longer than the devices into which it is inserted. Moreover, the lamp could be used for rear-projection televisions as well as general illumination.

The trick to a longer life, for light bulbs at least, is to ensure that the lamp has no electrodes. Although electrodes are undeniably convenient for plugging bulbs directly into the lighting system, they are also the main reason why lamps fail. The electrodes wear out. They can react chemically with the gas inside the light bulb, making it grow dimmer. They are also difficult to seal into the structure of the bulb, making the rupture of these seals another potential source of failure.

Scientists working for Ceravision, a company based in Milton Keynes, in Britain, have designed a new form of lamp that eliminates the need for electrodes. Their device uses microwaves to transform electricity into light. It consists of a relatively small lump of aluminium oxide into which a hole has been bored. When the aluminium oxide is bombarded with microwaves generated from the same sort of device that powers a microwave oven, a concentrated electric field is created inside the void.

If a cylindrical capsule containing a suitable gas is inserted into the hole, the atoms of the gas become ionised. As electrons accelerate in the electric field, they gain energy that they pass on to the atoms and molecules of the gas as they collide with them, creating a glowing plasma. The resulting light is bright, and the process is energy-efficient. Indeed, whereas traditional light bulbs emit just 5% of their energy as light, and fluorescent tubes about 15%, the Ceravision lamp has an efficiency greater than 50%.

Because the lamp has no filament, the scientists who developed it think it will last for thousands of hours of use—in other words, for decades. Moreover, the light it generates comes from what is almost a single point, which means that the bulbs can be used in projectors and televisions. Because of this, the light is much more directional and the lamp could thus prove more efficient than bulbs that scatter light in all directions. Its long life would make the new light ideal for buildings in which the architecture makes changing light bulbs complicated and expensive. The lamps' small size makes them comparable to light-emitting diodes but the new lamp generates much brighter light than those semiconductor devices do. A single microwave generator can be used to power several lamps.

Another environmental advantage of the new design is that it does not need mercury, a highly toxic metal found in most of the bulbs used today, including energy-saving fluorescent bulbs, fluorescent tubes and the high-pressure bulbs used in projectors. And Ceravision also reckons it should be cheap to make. With lighting accounting for some 20% of electricity use worldwide, switching to a more efficient system could both save energy and reduce emissions of climate-changing greenhouse gases.

Belle Mellor

