Air-gen technology

■ The discovery of air-gen technology

In 2020, during a series of experiments on protein nanowires, filaments which are able to conduct electricity and which are produced by a bacterium called Geobacter, a group of researchers from the University of Massachussetts Amherst discovered that clean energy could be produced from the humidity naturally present in the air by the so-called "air-gen" effect.

■ How the technology works

The air-gen technology employs a very thin film of protein nanowires. The lowest part of the film lies on an electrode, while in the upper part there is a small electrode, which covers only a small part of the film.

The film absorbs humidity naturally present in the air; water molecules floating all around in the air have a very short mean free path (i.e. average distance travelled by a moving particle, such as an atom, a molecule, or a photon, before colliding with other particles of the same substance). As humid air passes through air-gen film's minuscule holes, this creates a difference in charge between the two electrodes, in other words, electricity. This way, the material behaves like a battery, generating and storing energy; as humidity is always present in the air, electricity can be generated regardless of weather conditions or time of the day.

■ The future of air-gen technology

The air-gen effect is the same effect that creates lightning in clouds during a storm; for this reason, researchers believe that this technology, if employed on a larger scale, could be able to generate an amount of energy suitable to meet the demand of energy for everyday use. In theory, thousands of air-gen layers can be put one on top of another, increasing the amount of power produced by the device which, according to the researchers, could produce kilowatts of power for general usage. The researcher team also believes that their air-gen devices could one day be far more efficient than other renewable sources of energy such as solar and wind power, which have the big drawback of being totally dependent on climate and weather conditions. In addition, the material can be engineered into a variety of forms to blend into the environment, which is generally impossible with facilities as visually noticeable as a solar farm or wind turbine.



to blend: mescolarsi to collide: collidere mean free path: percorso libero medio

1 Match the beginnings and endings.

- **1.** Air-gen technology...
- 2. The holes in the material...
- **3.** The difference in charge between the two layers of the material...
- **4.** The air-gen technology material...
- 5. With air-gen technology, ...
- 6. The air-gen effect...
- 7. One day, air-gen devices...
- 8. Air-gen materials...

- a. is electricity.
- **b.** electricity can be generated regardless of the weather.
- **c.** behaves like a battery.
- **d.** exploits the natural humidity of air to produce electricity.
- e. could be more efficient than other renewable sources.
- f. are smaller than 100 nanometres.
- g. will be able to blend into the environment.
- **h.** is the same which creates lightning in clouds.

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2 Read the text and answer the questions.

Air-gen Technology

Scientists at the University of Massachussetts Amherst have developed a device that uses a natural protein to create electricity from moisture in the air. This new technology could have significant implications for the future of renewable energy, climate change, and in the future of medicine. As reported in the journal Nature, the researchers have created a device they call an "Air Gen", or air-powered generator, with electrically conductive protein nanowires produced by the microbe Geobacter. The air-gen connects electrodes to the protein nanowires in such a way that electrical current is generated by the water vapour naturally present in the atmosphere; that is, they are literally making electricity out of thin air. The air-gen generates clean energy 24/7; the new technology is non-polluting, renewable, and low-cost. It can generate power even in the areas with extreme low humidity, such as the Sahara Desert. It has significant advantages over other forms of renewable energy including solar and wind, because, unlike these other renewable energy sources, the air-gen does not require sunlight or wind and it even works indoors. The air-gen device requires only a thin film of protein nanowires less than

10 microns thick. The bottom of the film rests on an electrode, while a smaller electrode that covers only part of the nanowire film sits on top. The film absorbs water vapour from the atmosphere. A combination of electrical conductivity and surface chemistry of the protein nanowires, together with the fine pores between the nanowires within the film, establishes the conditions that generate an electric current between the two electrodes. The researchers say that the current generation of air-gen devices are able to power small electronic devices, and they expect to bring the invention to commercial scale soon. The next steps of their plan include developing a small air-gen "patch" that can power electronic wearables, such as health and fitness monitors and smart watches, which would eliminate the need for traditional batteries. They also hope to develop air-gens to apply to mobile phones to eliminate periodic charging. The ultimate goal of the researchers is to make large-scale systems; for example, the technology might be incorporated into wall paint, which could help power homes.

Adapted from: https://www.youtube.com/ watch?v=2rJ7OVol9WI&t=12s - New Green Technology Generates Electricity 'Out of Thin Air' - Air-gen posted by OPT

- 1. Who developed the air-gen technology?
- 2. In what fields will it have the most significant implications?
- 3. What are the protein nanowires used for air-gen produced by?
- 4. How long can the air-gen produce electricity for?
- 5. What are its advantages?
- **6.** What is the size of the protein nanowires required for the process?
- **7.** What are the conditions that make electricity generation possible?
- **8.** What can be powered by air-gen electricity at present?
- **9.** What are the next steps of the research?
- **10.** What is the ultimate goal of researchers?



