TRANSFORM
Energy Systems through Game-changing Technology

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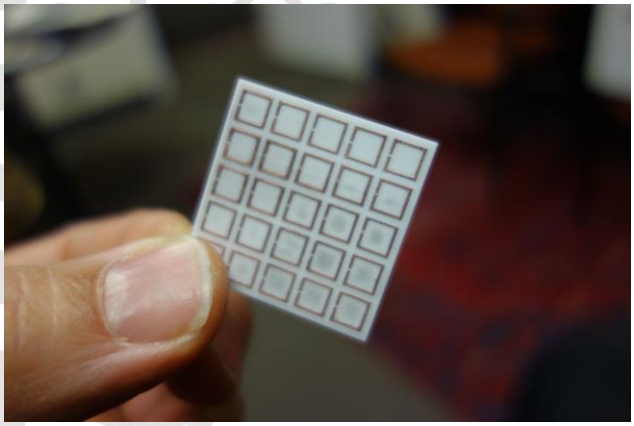
RENEWABLES | SMART GRID | STORAGE | SUSTAINABLE MOBILITY | SUSTAINABILITY ANALYSES



GENERATING BUZZ WITH METAMATERIALS

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Metamaterials seem to come straight out of science fiction. By controlling the precise shape and configuration of microscopic materials such as plastic or metals, investigators can bend light or sound in unnatural ways. The result could be invisibility cloaks, earthquake shields, or—according to Waterloo's Dr. Omar Ramahi—energy harvesting devices.

To test their theory, Ramahi and members of his research group assembled a split-ring resonator (SRR), made up of tiny C-shaped loops. When zapped with microwaves at a specific frequency, these carefully arranged metamaterials generate a strong magnetic field within the SRR array and a relatively high voltage across the gap in each ring.

To harvest that energy, the team inserted a resistor into the gap to absorb the power. They measured a voltage of 611 mV across the resistor, proving the feasibility of using SRRs to collect power from electromagnetic fields.

The researchers then took a step back, looking at how efficiently their split-ring resonator converted microwaves into energy. By experimenting with the angles at which the microwaves hit the SRR, the team could determine the ideal configuration for energy collection at different frequencies.

This work creates the potential of harvesting energy from the abundant electromagnetic fields in the world around us. Even more interestingly, Dr. Ramahi's group is developing the same technology to harvest energy from the solar infrared and visible spectra. Future experiments will focus on feeding the collected current into a power grid, opening up new frontiers in the world of sustainable energy.

Partners: Natural Sciences and Engineering Research Council of Canada, Saudi Arabian Ministry of Higher Education