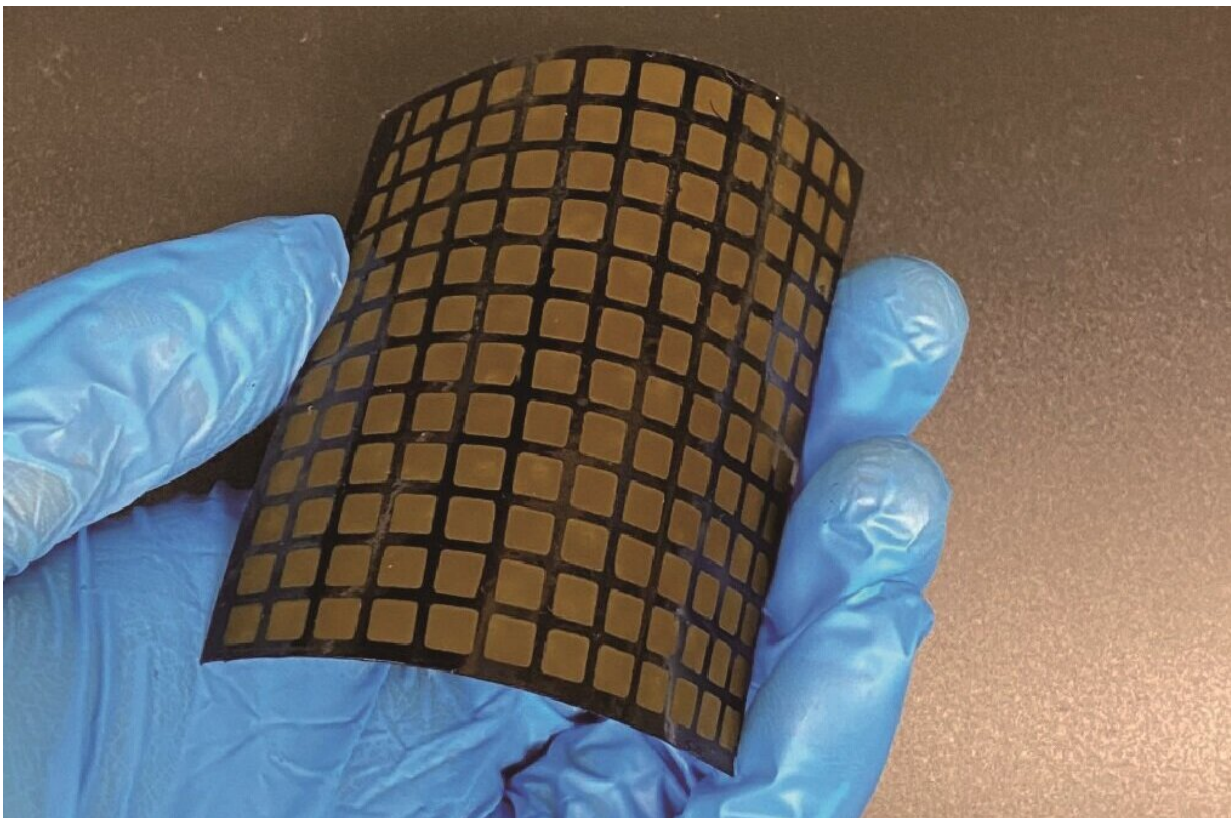


# Flexible, wearable X-ray detector doesn't require heavy metals

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A flexible semiconductive metal-organic framework was incorporated into a prototype wearable X-ray detector for radiation monitoring and imaging. Credit: Adapted from Nano Letters 2021, DOI: [10.1021/acs.nanolett.1c02336](https://doi.org/10.1021/acs.nanolett.1c02336)

X-ray imaging is a fast and painless way for doctors to see inside a person. But radiation detectors, which go under the body part being

imaged, are rigid panels that contain harmful heavy metals, such as lead and cadmium. Now, researchers in ACS' *Nano Letters* report a proof-of-concept wearable X-ray detector prepared from nontoxic metal-organic frameworks (MOFs) layered between flexible plastic and gold electrodes for high-sensitivity sensing and imaging.

Most X-ray detectors are integrated into big, immobile instruments, such as computerized tomography (known as CT) and mammography equipment, or are stiff, like the sharp-edged bitewing detectors used in dental offices. Detectors that could conform to rounded body parts or mold to the inside of confined spaces could be beneficial in some [radiation](#) monitoring and medical imaging applications. Previous researchers have used MOFs for flexible [radiation detectors](#) because they are semiconducting materials that respond to [electromagnetic radiation](#) by creating an [electrical current](#). However, some of these MOFs still include lead, just like the X-ray detectors that are currently in use. So, Shuquan Chang, Shenqiang Ren and colleagues wanted to create a heavy-metal-free MOF for a flexible X-ray [detector](#) and imager.

The researchers mixed a solution of nickel chloride salt and 2,5-diaminobenzene-1,4-dithiol (DABDT) for several hours, creating a MOF in which nickel linked the DABDT molecules. In initial tests, the nickel-containing MOF was more sensitive than recently reported detectors when irradiated with 20 keV X-rays, equivalent to the energy released during medical diagnostic imaging. Then, to make a flexible X-ray radiation detector, the team sandwiched the nickel-containing MOF between gold film electrodes, one of which was on a flexible plastic surface. They used copper wires to transmit current from each pixel of a 12x12 array and covered the whole device with a silicone-based flexible polymer. Finally, they placed an aluminum letter "H" on the detector and irradiated it with X-rays, measuring a much lower current output underneath the H than under the unimpeded material.

The researchers say that their proof-of-concept device is promising for the next generation of radiology imaging equipment and radiation detection when wearable or flexible devices are needed.

**More information:** "Flexible Lead-Free X-ray Detector from Metal-Organic Frameworks" *Nano Letters* (2021). [DOI: 10.1021/acs.nanolett.1c02336](https://doi.org/10.1021/acs.nanolett.1c02336)

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