Elemental and magnetic imaging using X-rays and a microscope

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A team of researchers has developed a new microscope that can image the elemental and magnetic properties of a wide range of energy-important materials that are used in devices such as solar cells and solid-state lighting.

The imager is based on a technique known as X-ray excited luminescence microscopy (XELM). It was created by hitching a standard optical microscope to a synchrotron X-ray source. Synchrotrons produce X-rays and other forms of electromagnetic radiation by sending electrons on a curved path at nearly the speed of light.

When the X-rays strike the material being imaged, some of them are absorbed, which causes the sample to luminesce. The microscope portion of the imager is able to detect differences in this luminescence, which is directly related to both the elements in the sample and their magnetic properties. This technique combines the spatial resolution of optical microscopy with the element and magnetic specificity and precision of synchrotron radiation.

It is able to spatially resolve features as small as one micron. However, this value was degraded in practice due to vibrations or subtle shifting of the systems used to direct the X-ray beam, though future refinements should alleviate any stability issues.

XELM has some advantages over other techniques in that it is especially useful at low temperatures and can image in the presence of electric and

magnetic fields. The results were accepted for publication in the American Institute of Physics' journal Review of Scientific Instruments.

More information: "Elemental and magnetic sensitive imaging using x-ray excited luminescence microscopy" *Review of Scientific Instruments*.

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