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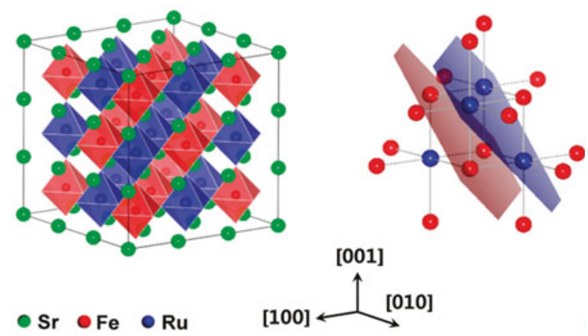
A (111)-ordered Sr_2FeRuO_6 superlattice displays room-temperature magnetic ordering

Oxide heterostructures displaying interfacial magnetic order have been the subject of much study but their use is currently limited by low magnetic ordering temperatures. In the May 5 online edition of *Chemistry of Materials* (DOI: 10.1021/cm200454z), S.-K. Kim at Seoul National University and his colleagues report on the growth of (111)-oriented Sr_2FeRuO_3 superlattices having a robust ordered-double-perovskite structure that display magnetic ordering up to 390 K.

The researchers managed to overcome thermodynamic barriers to (111)-oriented growth by using a thin $SrRuO_3$ buffer layer deposited on Ti^{4+}-terminated $SrTiO_3$ (111) as a template. They then deposited 55 alternating layers of $SrFeO_3$ and $SrRuO_3$ to build up a superlattice while maintaining precise structural and chemical control over each layer.

Using a combination of reflection high energy electron diffraction, x-ray diffraction, and transmission electron microscopy, the researchers confirmed the structure of the superlattices. They probed the temperature-dependent magnetization of the structure and found that it possesses a magnetic-ordering (ferromagnetic or ferrimagnetic) critical temperature (T_c) of ~390 K, more than double the T_c of isolated $SrRuO_3$ and $SrFeO_3$. They attribute this unusual behavior to band broadening and electron transfer that typically occur in ordered double perovskites, as well as ferromagnetic order stabilized by the addition of Ru^{5+} ions.



Ordered-double-perovskite structure of Sr_2FeRuO_3 shows stacking of Ru and Fe ions in (111) planes. Reprinted with permission from *Chem. Mater*. (May 5, 2011), DOI: 10.1021/cm200454z. ©2011 American Chemical Society.

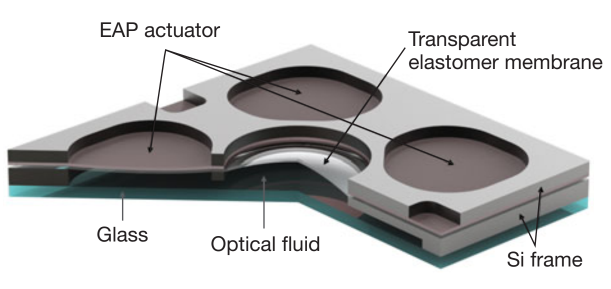
The researchers said that their (111)-ordered superlattice-growth method may be applied to the growth of different oxide systems to achieve new kinds of room-temperature electronic and magnetic ordering.

Steven Spurgeon

Polymer actuators focus a liquid microlens

Developing microlenses with focusing capability is becoming increasingly desirable for use in microimaging systems such as those found in mobile phone cameras. A flexible cavity filled with liquid forms a lens which can be deformed and focused simply by the movement of liquid into or out of the cavity. By using an electroactive polymer actuator to apply pressure to the liquid, a research team at Samsung Advanced Institute of Technology has fabricated tunable microlenses which operate at low voltages and can be microfabricated in large arrays.

In the May 15 issue of *Optics Letters* (DOI: 10.1364/OL.36.001920; p. 1920), S.T. Choi and co-workers describe their device based on a silicon frame sandwiched between the elastomer polydimethoxylsilane (PDMS) on one side and glass on the other. The silicon is shaped so as to form a 2.4 mm diameter central circle for the lens, linked to four surrounding reservoirs by microfluidic channels. These cavities are filled with a high refractive index optical liquid and then sealed using an ultraviolet curable adhesive. A film of the electroactive actuator poly(vinylidene fluoride-trifluoroethylene-chlorotrifluoroethylene) (1.5 μm thick) is laminated onto the PDMS face of the device, while leaving clear the lens. In order to enhance the response of the polymer at low voltages, further films are alternately layered with thin aluminum electrodes to form a multilayered actuator. A complete stack of 15 electrodes is connected vertically by depositing a post of aluminum into a laser-drilled hole.



Schematic diagram of the varifocal microlens, based on a liquid-filled elastomeric cavity. Reprinted with permission from *Opt. Lett.* **36** (10) 2011 (DOI: 10.1364/OL.36.001920; p. 1920). © 2011 The Optical Society.

Applying a driving voltage to the actuators caused them to depress the elastomer beneath them and force the fluid through the channels and into the lens cavity of the device. As a result, the elastomer over the lens is pushed out and the optical length of the cavity is altered. At 40 V, the combined force of the actuators on each of the four reservoirs induced a 37 μm displacement of the lens. The device was integrated into a mobile phone camera to demonstrate tunable fo-

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