

Solid-phase epitaxy produce magnetic oxides with novel magnetic properties

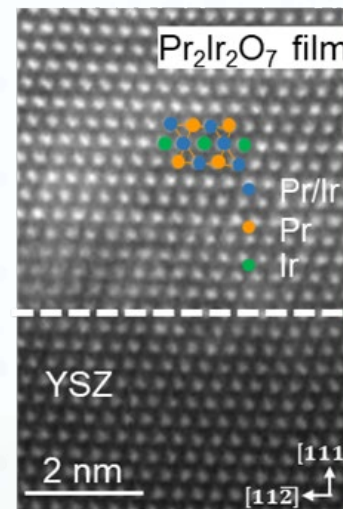
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The magnetism of materials arises from *magnetic moments* associated with particular atoms. A magnetic moment is a bit like a tiny bar magnet. If all the moments point in the same direction, the material behaves like a permanent magnet, but there are many other possible arrangements with different behaviors.

The Wisconsin MRSEC has created thin films of a fascinating magnetic material, $\text{Pr}_2\text{Ir}_2\text{O}_7$, in which the magnetic moments are *frustrated*: No matter how they are arranged, some of the moments are always fighting to change their direction, like two bar magnets with their north poles shoved together. Frustration creates a rich landscape for discovery and manipulation of new magnetic effects and of electronic phenomena linked to magnetism.

The $\text{Pr}_2\text{Ir}_2\text{O}_7$ was synthesized by solid-phase epitaxy, a process in which a structurally disordered, amorphous layer is transformed into an ordered crystal. This synthesis method avoids evaporation of iridium during crystal growth, which limits synthesis by conventional methods. A key feature of the thinness of the films is that they are stretched during growth, which provide further control of their magnetic properties.

Epitaxial iridate synthesis



Novel magnetic properties in thin films

