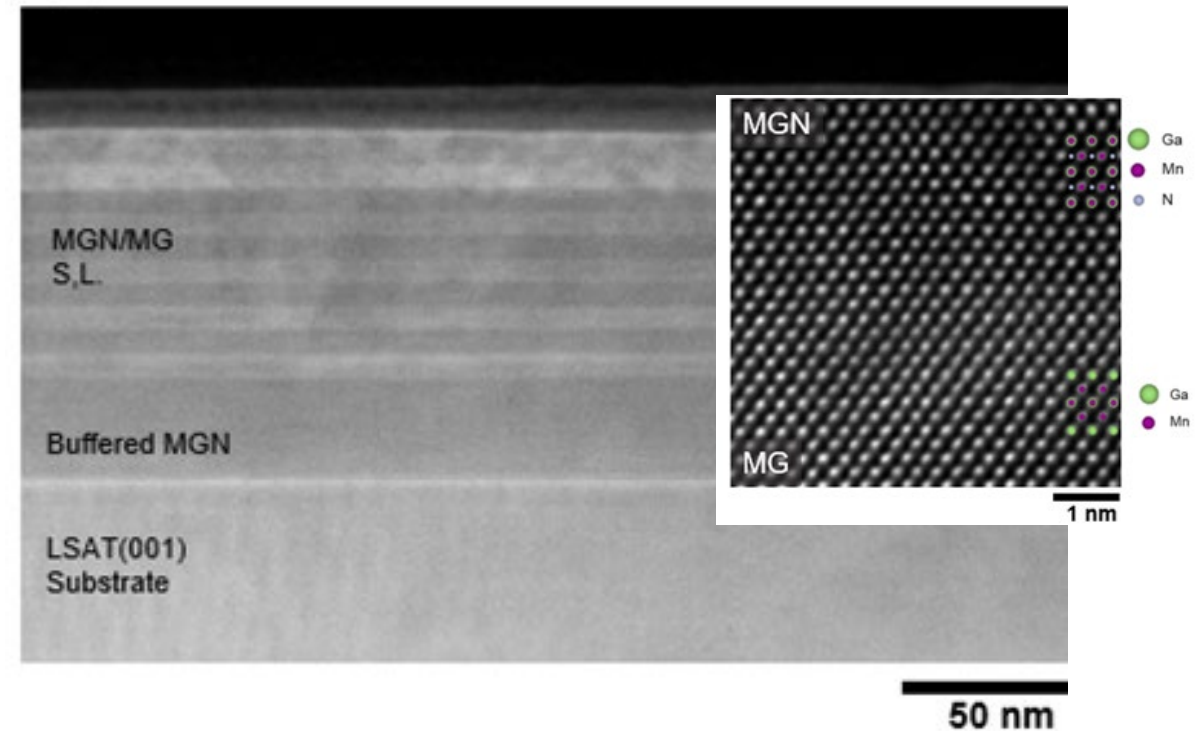


Magnetism arises from regular patterns of spins associated pattern atoms, arranged in regular arrays in crystals. Some materials, like Mn_3GaN are non-collinear antiferromagnets: neighboring spins point in different directions and exactly cancel each other out. Other materials like Mn_3Ga are ferrimagnets: neighboring spins point in opposite directions, but do not exact cancel out.

Wisconsin MRSEC researchers have create an artificially magnetic material by alternating layers of Mn_3GaN and Mn_3Ga in perfect atomic registry with one another. The resulting material offers best-of-both worlds performance for advanced electronic devices based on spin. Their magnetism is easy to switch to encode information, but it is stable once set to a specific state. These outstanding properties arise both from the properties of the layers themselves and from the unique atomic environments that exist where the two layers meet. As a result, combining materials this way lets materials scientists design materials that cannot otherwise exist.



An electron microscope image of the artificial layered material synthesized on a substrate. (inset) A zoomed-in electron microscope image showing the continuous pattern of atoms shared by one Mn_3Ga layer (bottom) and one Mn_3GaN layer (top).