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Nanomagnetism on Artificially modulated Single Crystalline Substrates

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We have developed a new experimental technique under ultra-high vacuum to grow epitaxially the ‘compositionally wedged’ alloys on single crystalline substrates, which can be used to produce single crystalline templates with continuously modulated lattice constants, as well as with gradually varied chemical compositions. As an example, it is applied to investigate Fe on $\text{Cu}_x\text{Au}_{1-x}/\text{Cu}(100)$ grown at room temperature. Its structure and magnetism are determined as a function of compositions when the in-plane lattice constant is fixed (strained films) and when the in-plane lattice constants are variable (strain-released films). In this way, the structural and compositional contributions to the magnetic properties can be well separated and independently studied. The other applications of this new technique will also be discussed.