

# Buffer-Layer-Driven Control of Compensation and Anisotropy in Co/Tb Multilayers

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Ferrimagnetic materials with antiferromagnetic exchange combine key advantages of ferromagnets and compensated antiferromagnets. They can be driven and read out efficiently, yet they can approach a near-zero net moment with reduced stray fields. Rare-earth/transition-metal ferrimagnets in thin-film form are particularly relevant for spintronic devices, magnetic recording, and emerging computing concepts. All-optical switching has been demonstrated in representative systems such as GdFeCo and CoTb [1,2]. A further practical motivation is that antiferromagnetically coupled systems can exhibit higher characteristic resonance frequencies than simple ferromagnets, supporting faster magnetic response in devices [3].

Some ferrimagnets exhibit a magnetization compensation temperature,  $T_{MC}$ , at which the opposing sublattice magnetizations cancel due to their different temperature dependences. Close to  $T_{MC}$ , several phenomena of interest for applications, such as magnetic imprinting, have been reported, thus making controlled access to  $T_{MC}$  technologically valuable [4]. In compound ferrimagnets,  $T_{MC}$  is typically tuned by composition and intermixing [5]. Multilayers, in contrast, offer an additional degree of freedom: interface engineering. Introducing a buffer can systematically adjust interfacial structure, roughness, and effective coupling without changing the nominal magnetic layer thicknesses.

We present a systematic study of ferrimagnetism in Co/Tb multilayers, focusing on the impact of an Au buffer layer on magnetic anisotropy and compensation temperature. We investigate the model stack Au( $y$ )/Pt(5 nm)/[Co(0.7 nm)/Tb( $x$ )] $\times$ 6/Au(5 nm). Using magnetometry and magneto-optical spectroscopy, we extract  $T_{MC}$  as a function of the buffer layer parameters. We find that increasing the Au buffer thickness shifts  $T_{MC}$  to higher temperatures, enabling a large tuning range (approximately 90–395 K) even for nominally identical Co/Tb layer thicknesses. The trend correlates with buffer-induced changes in interface morphology [6], indicating that  $T_{MC}$  can be engineered via interfacial effects rather than solely through compositional changes.

## References:

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