Induced Ferromagnetism at Interfaces between BiFeO$_3$ and YBa$_2$Cu$_3$O$_7$\textsuperscript{1} JIAN-XIN ZHU, XIAO-DONG WEN, Los Alamos National Laboratory, J.T. HARALDSEN, Los Alamos National Laboratory and James Madison University, C. PANAGOPoulos, E.E.M. CHIA, Nanyang Technological University — Transition metal oxides (TMOs) exhibit many emergent phenomena ranging from high-temperature superconductivity and giant magnetoresistance to magnetism and ferroelectricity. In addition, when TMOs are interfaced with each other, new functionalities can arise, which are absent in individual components. Here, we report results from first-principles calculations on the magnetism at the BiFeO$_3$/YBa$_2$Cu$_3$O$_7$ interfaces. By comparing the total energy for various magnetic spin configurations inside BiFeO$_3$, we are able to show that the ferromagnetism is induced near the interface. We further develop an interface exchange-coupling model and place the extracted exchange coupling interaction strengths from the first-principles calculations, into a resultant generic phase diagram. The emergence of interfacial ferromagnetism should have implications to electronic and transport properties.

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