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From quasi-2D metal with ferromagnetic bilayers to Mott insulator with G-type antiferromagnetic order in $Ca_3(Ru_{1-x}Ti_x)_2O_7$[1] JIN PENG, GAOCHAO WANG, Department of Physics and Engineering Physics, Tulane University, New Orleans, LA 70118, XIANGLIN KE, TAO HONG, Neutron Scattering Science Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, ZHIQIANG MAO, Department of Physics and Engineering Physics, Tulane University, New Orleans, LA 70118 — $Ca_3Ru_2O_7$ exhibits unique electronic and magnetic properties, such as giant magnetoresistance, a quasi-2D metallic ground state, and antiferromagnetic (AFM) order comprising of ferromagnetic bilayers coupled antiferromagnetically along the c-axis [1-3]. In this talk, we will show that only a few percent of Ti-doping at Ru sites can tune the ground state to a Mott-insulating state with "G"-type, nearest neighbor AFM order [4]. We have established the electronic and magnetic phase diagram of this doped system to address the underlying physics of such a Mott-transition. We find that a strong scattering effect due to the Ti ions" empty 3d orbital significantly reduces electrons" itinerancy, playing a pivotal role in the suppression of the bilayer ferromagnetism and inducing the Mott transition. These findings imply that $Ca_3Ru_2O_7$ involves competition between the antiferromagnetism due to the Mott transition and the itinerant ferromagnetism due to a Stoner instability. [1] X.N. Lin et al., Phys. Rev. Lett. 95, 017203(2005). [2] W. Bao et al., Phys. Rev. Lett. 100, 247203 (2008). [3] Y. Yoshida et al., Phys. Rev. B 69, 220411 (R) (2004). [4] X. Ke et al., Phys. Rev. B 84, 201102 (R) (2011).

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