Ion-size effects in HTS cuprates – dielectric versus magnetic pairing  

JEFFERY TALLON, MacDiarmid Institute, Industrial Research Ltd, 
BEN MALLETT, MacDiarmid Institute, Victoria University, NEIL ASHCROFT, 
LASSP, Cornell University — We have been exploring the systematic effects of 
changing ion size on superconducting and normal-state properties of the HTS 
cuprates. In the model system RA$_2$Cu$_3$O$_y$ (where R = La, . . . , Lu and A=Ba$_{2-x}$Sr$_x$) 
the maximum T$_c$ in the dome-shaped phase curve can be shifted from 70 to 110 K 
in the model system. Surprisingly T$_c$ correlates with the dielectric properties and 
not the magnetic properties. This highlights the fundamental importance of charge 
fluctuation and dielectric screening in the cuprates and may signal a novel pairing 
mechanism having its origin with quantized waves of electronic polarization.

Jeffery Tallon 
MacDiarmid Institute, Industrial Research Ltd

Date submitted: 02 Nov 2012

Electronic form version 1.4