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Tungsten Nitride Buffer Layers For Copper-Based Coated Conductors

David T. Shaw
Materials Engineering Research Laboratory
State University of New York at Buffalo
Amherst, NY

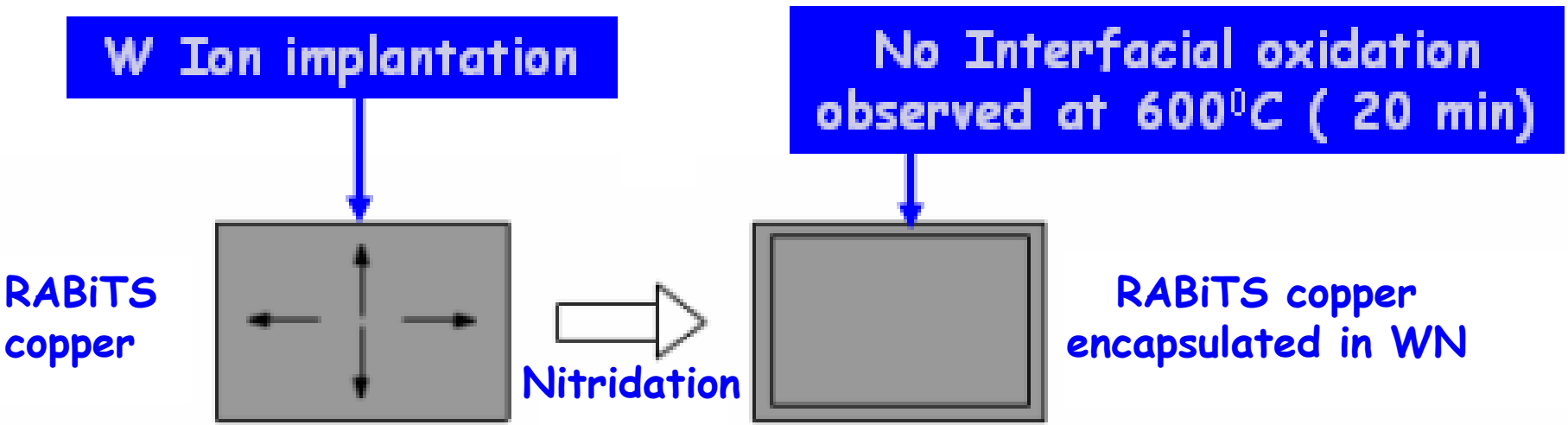
Contributions from A. Goyal, ORNL
J. Narayan, NCSU; and W. K. Chu, TCSUH.

Why W_xN ?

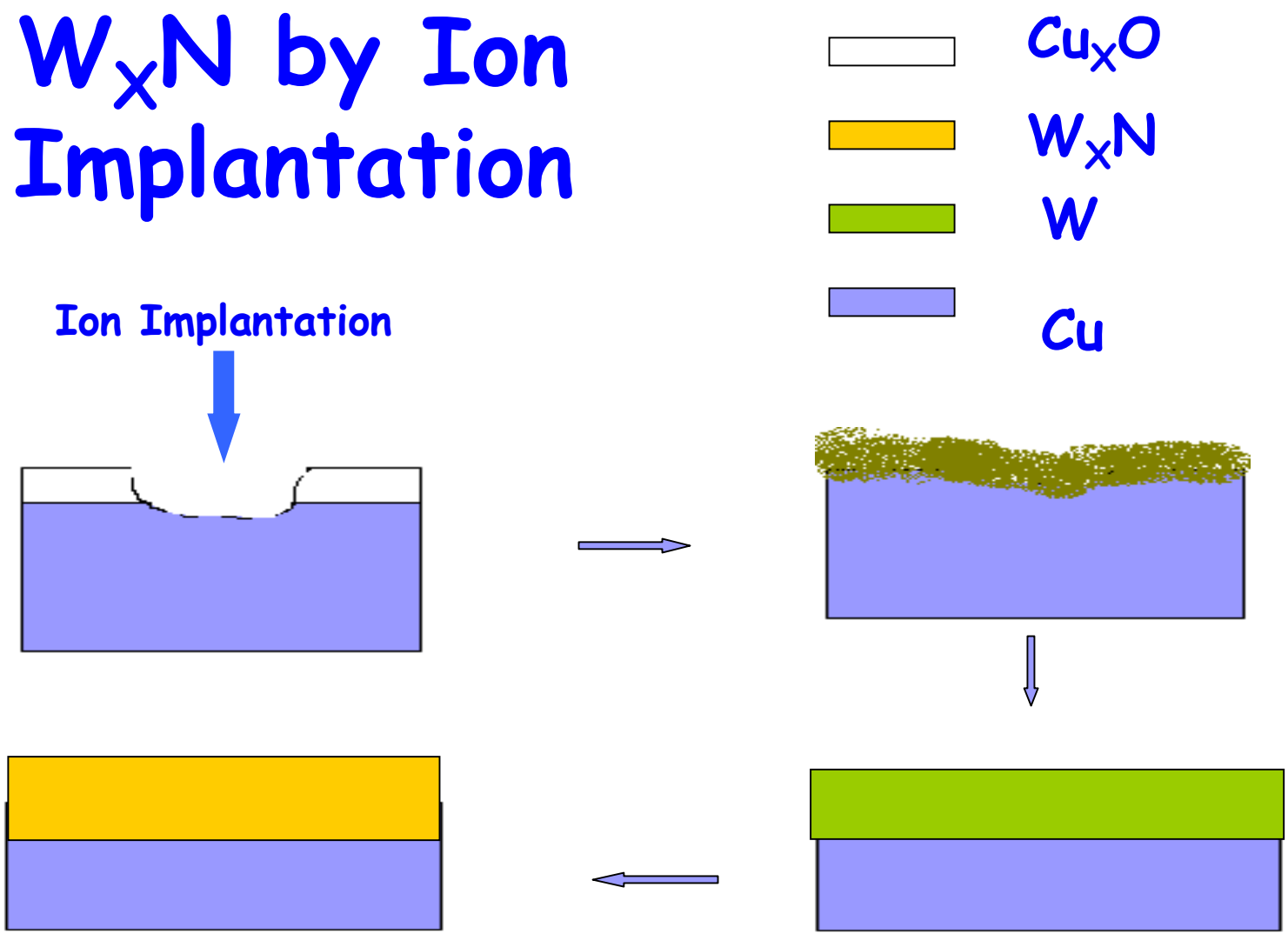
- WxN thin films are very good oxygen diffusion barrier materials.
- WxN thin films are electrically conductive (~ 200 to 600 $\mu\Omega$ cm).
- WxN is thermally and mechanically stable – W & N generally do not chemically interact with copper, making WxN extremely stable up to 700°C.
- The atomic lattice constant of WxN is about 4.21Å (~ that of MgO) .
- WxN becomes W_2N and its thin films have columnar microstructures with very small crystalline sizes and relatively smooth surface.

Formation of Buffer Layers by Annealing

WxN buffers serve as passivation, as well as epitaxial template layers.



W_xN by Ion Implantation



Buffer formation by Ion Implantation

- Ion implantation at 10 to 20 Kev solves the problems thin-film formation on Cu_XO.
- Ion-implanted films have been demonstrated to have high ahdesion.
- Ion-source developments at LLL can fabricate long-length CCs at rates ~ 3 min/meter.