3.032 Mechanical Behavior of Materials

Fall 2007

What does Moore's Law have to do with mechanical behavior of materials?

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http://www.cs.princeton.edu/courses/archive/fall01/cs597c/moore/moore2.jpg

Moore's Law: transistor density on integrated circuits doubles every 18 to 24 months.

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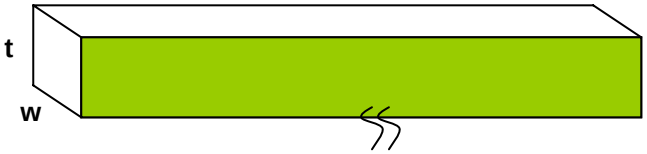

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http://www.eecg.toronto.edu/%7Evaughn/wafer3.jpg

http://commons.wikimedia.org/wiki/Image:Cyrix_cx9210_gfdl.jpg

Si wafer of integrated circuits

Image sources: http://library.thinkquest.org

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in Choi, Yoonjoon, et al. "Size Effects on the Onset of Plastic Deformation During Nanoindentation of Thin Films and Patterned Lines." *Journal of Applied Physics* 94 (November 2003): 6050-6058.

Real experiments of indentation on Al lines:

MD simulations of indentation on Al lines:

Choi, Van Vliet, Li and Suresh, *J. Appl. Phys.* (2003)

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http://www.webelements.com/webelements/elements/media/xtal-image/Al-bs.jpg

http://www.webelements.com/webelements/elements/media/xtal-image/Si-sf.jpg

http://www.webelements.com/webelements/elements/media/xtal-image/Si-bs.jpg

Al: fcc

a = 0.405 nm

Si: diamond cubic
(fcc with a basis)
a = 0.543 nm

http://www.webelements.com/webelements/elements/text/Al/xtal.html; http://www.webelements.com/webelements/elements/text/Si/xtal.html