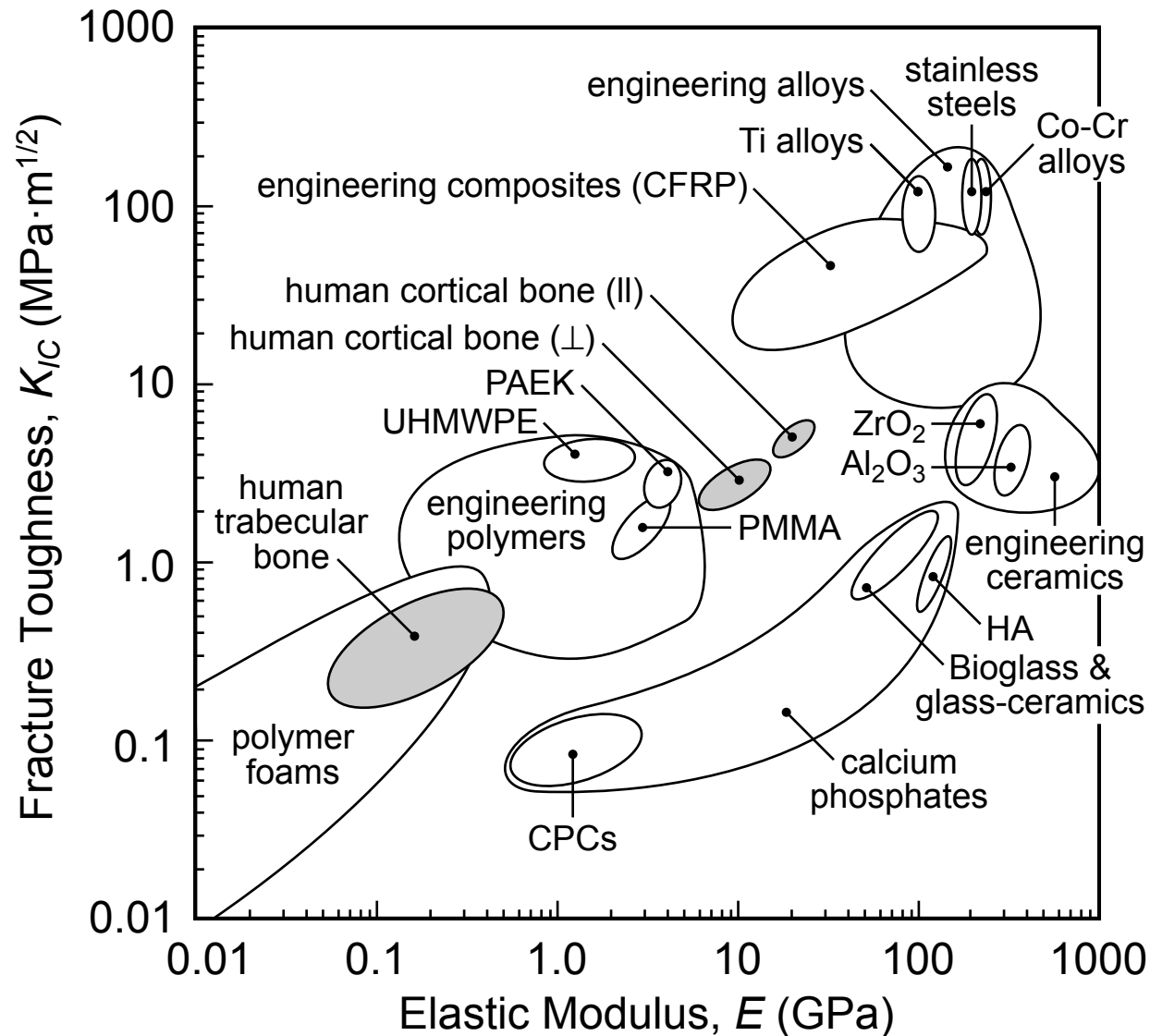
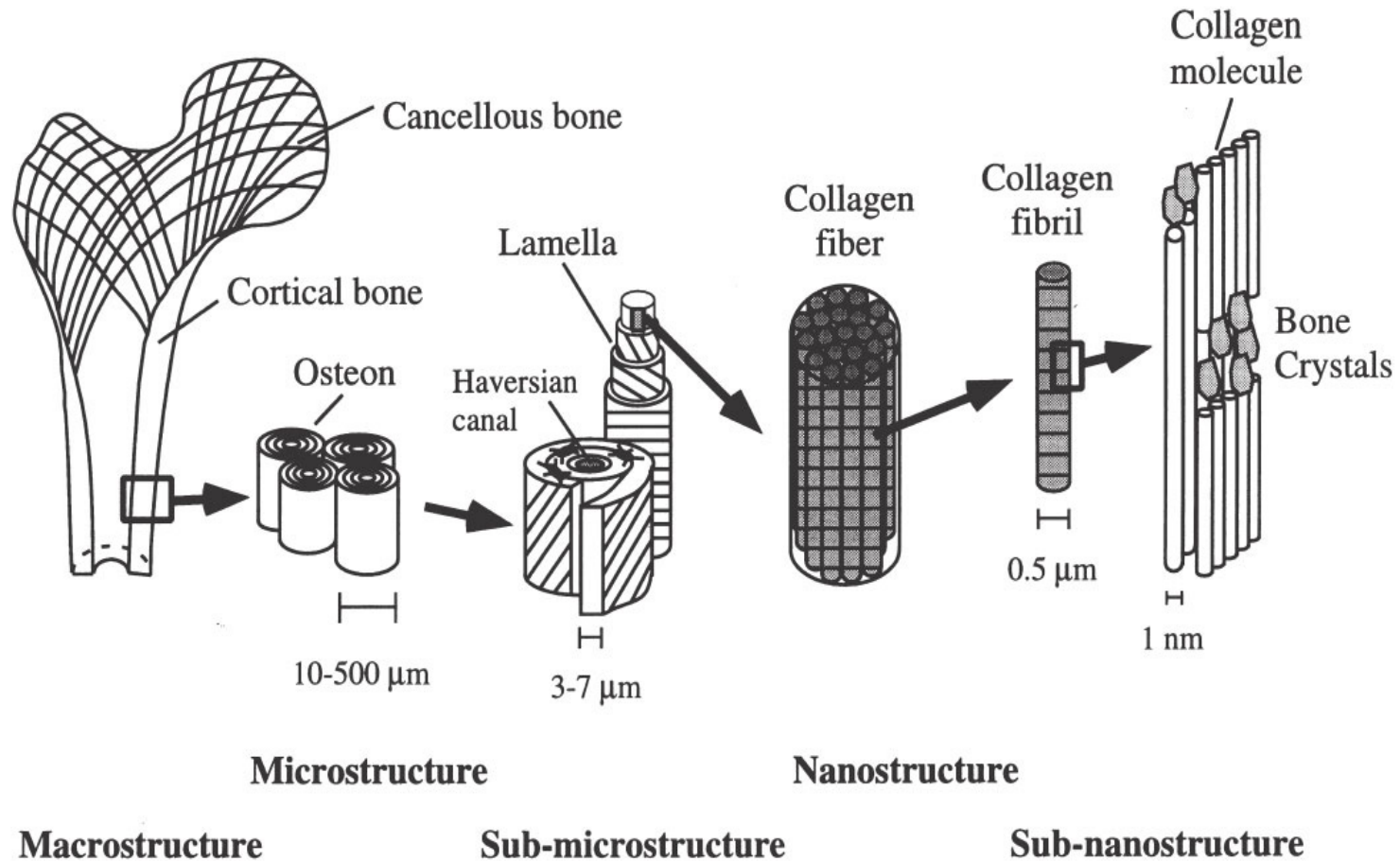


Mechanical Properties of Bone vs. Biomaterials



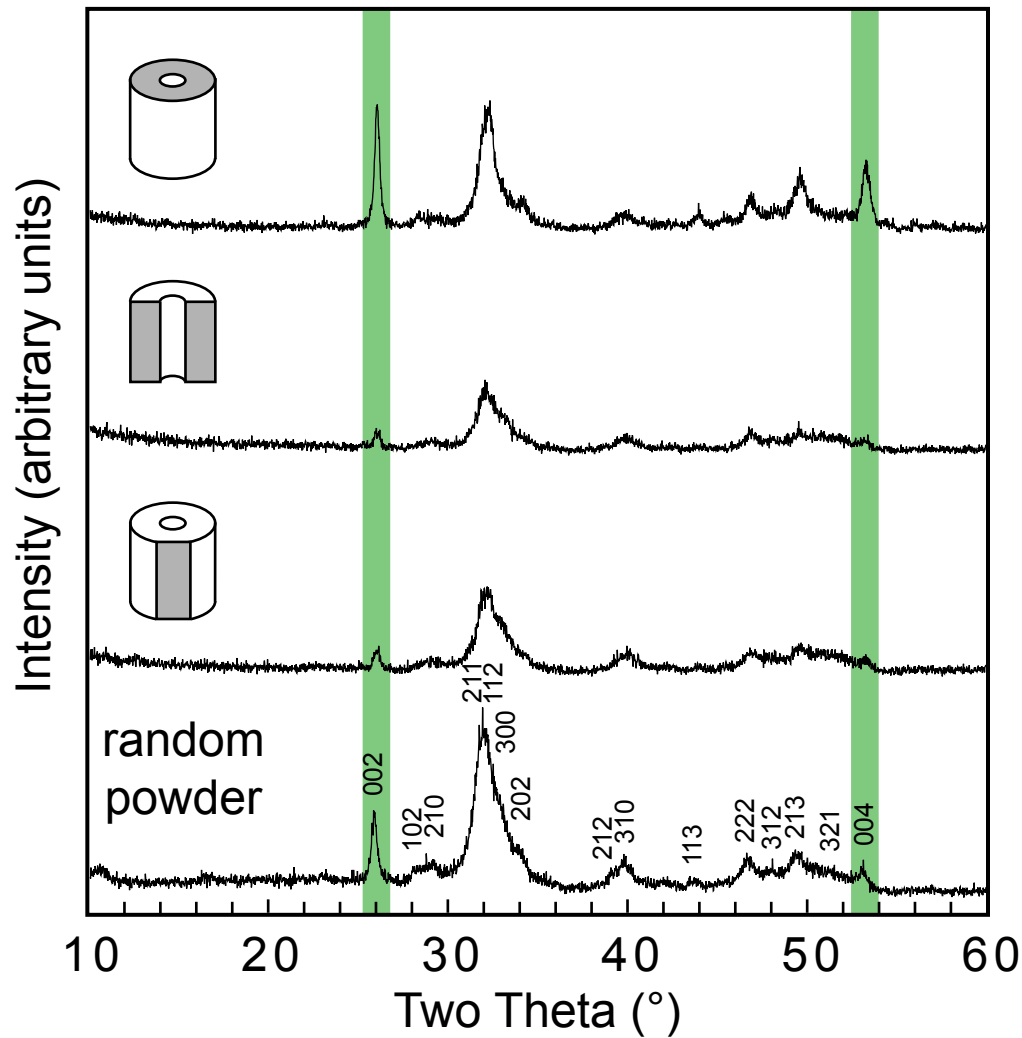
R.K. Roeder, *et al.*, *JOM*, 2008.

Hierarchical Structure of Bone Tissue

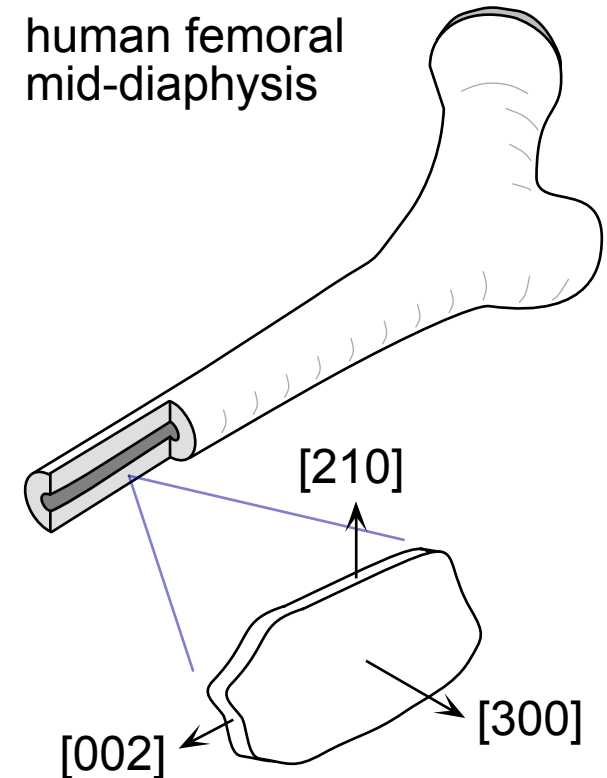


J-Y. Rho, *et al.*, *Med. Eng. Phys.*, 1998.

Preferred Orientation of Bone Mineral



human femoral
mid-diaphysis

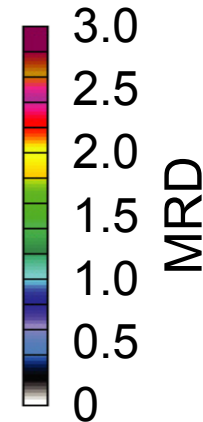
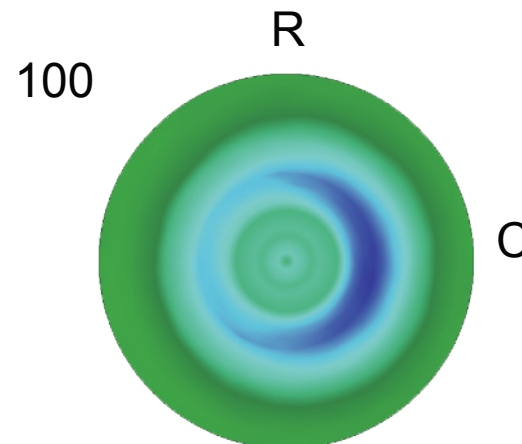
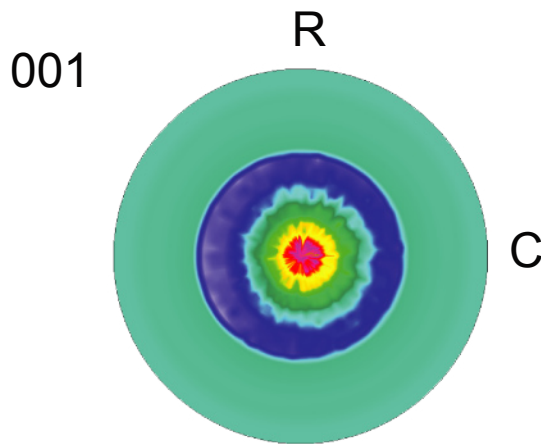
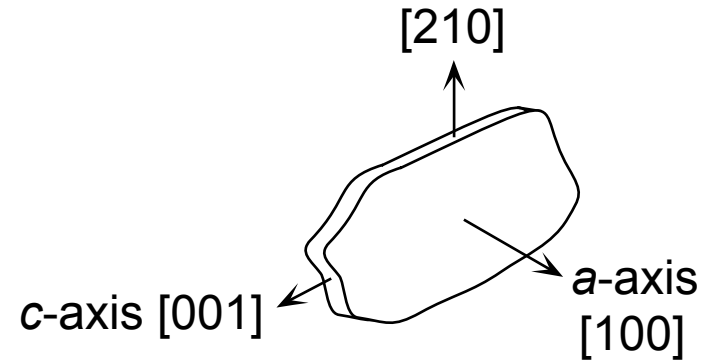
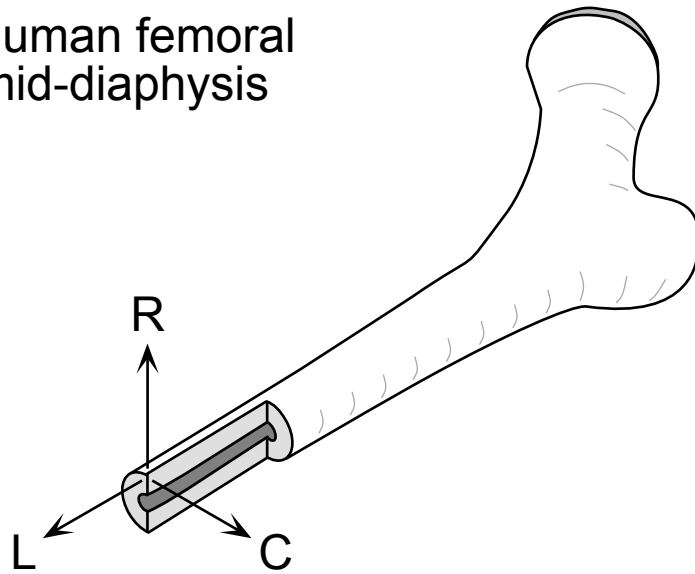


Roeder, et al., *J. Biomed. Mater. Res.*, 2003

Preferred Orientation of Bone Mineral

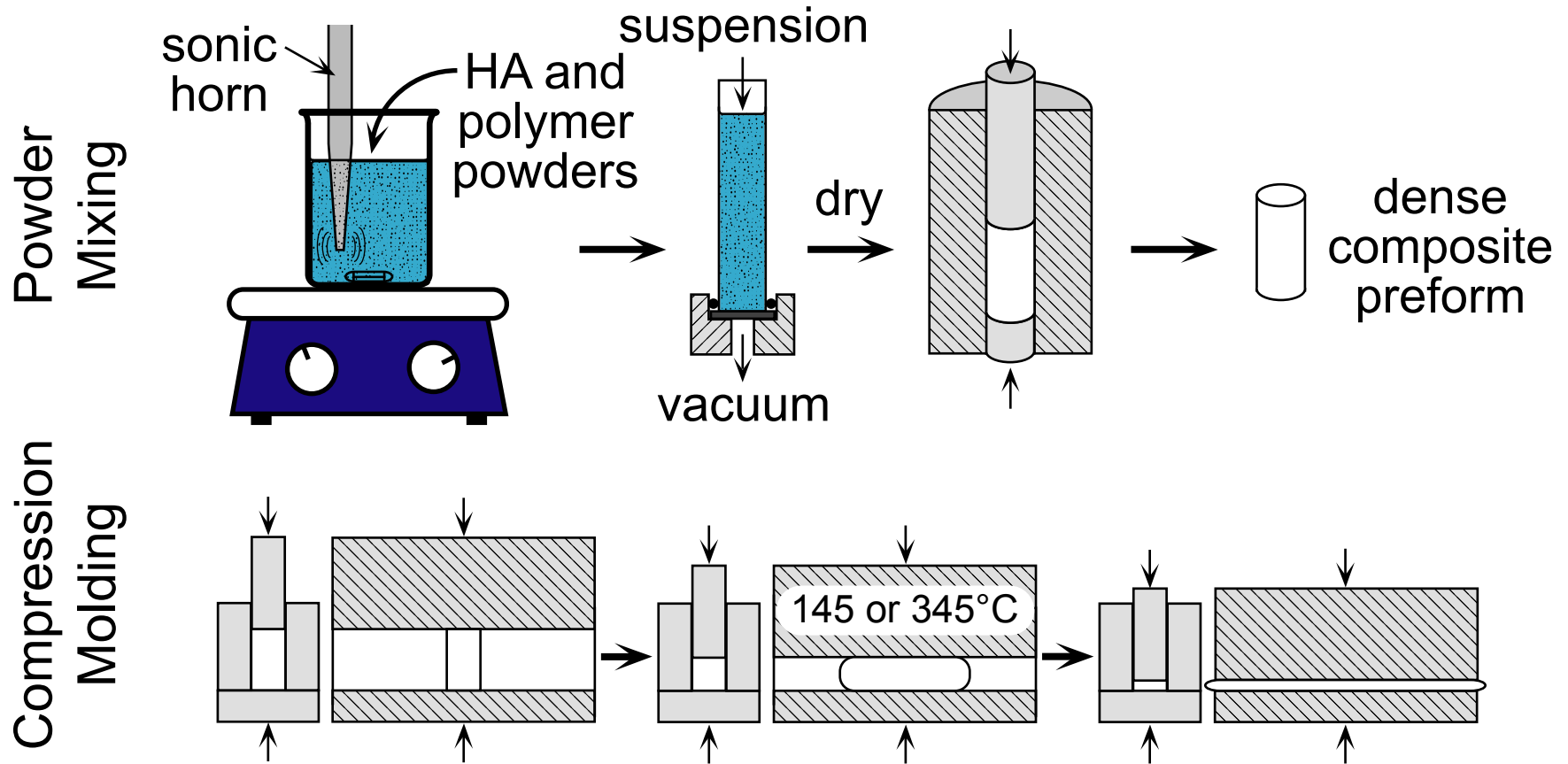
human femoral
mid-diaphysis

20-150 x 10-80 x 2-10 nm
average: 50 x 25 x 3 nm



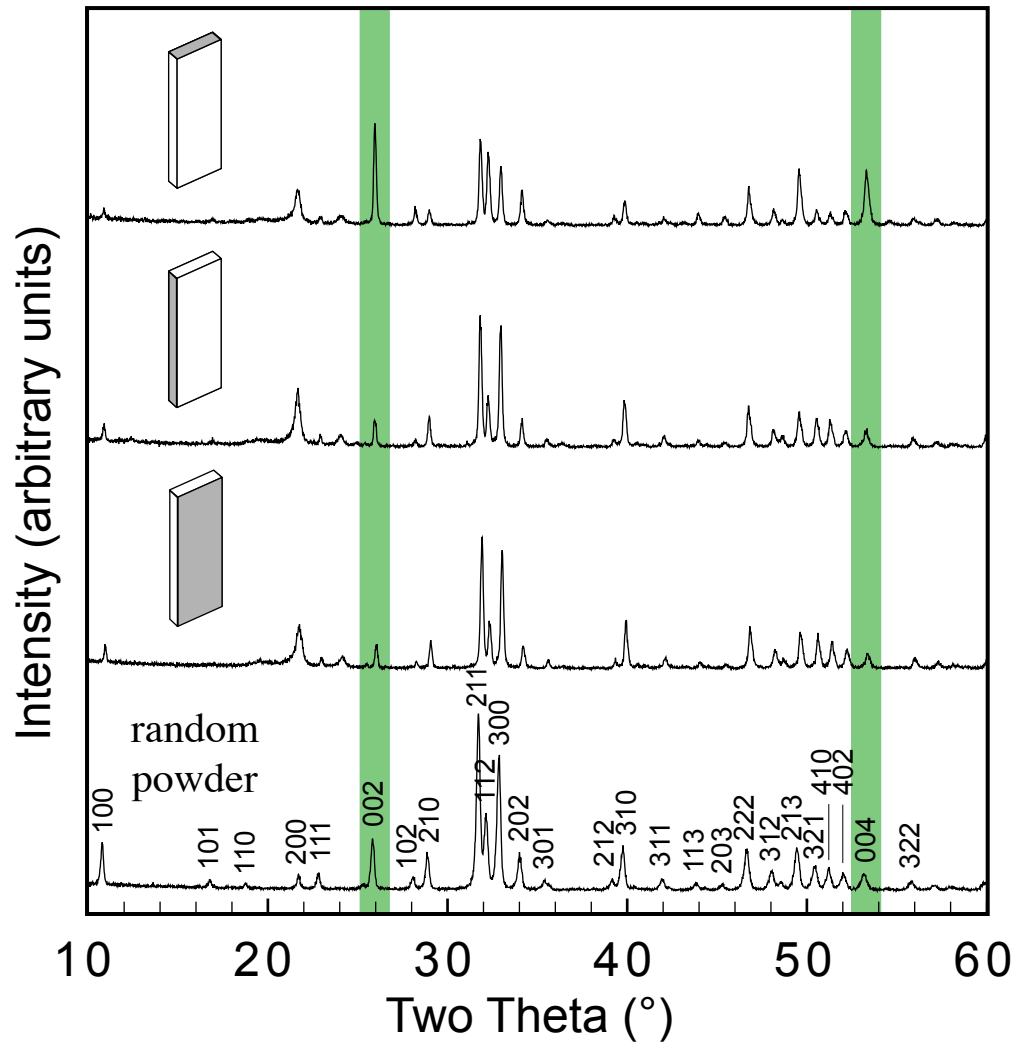
W. Yue and R.K. Roeder, 2006.

HA Whisker Reinforced Polymers

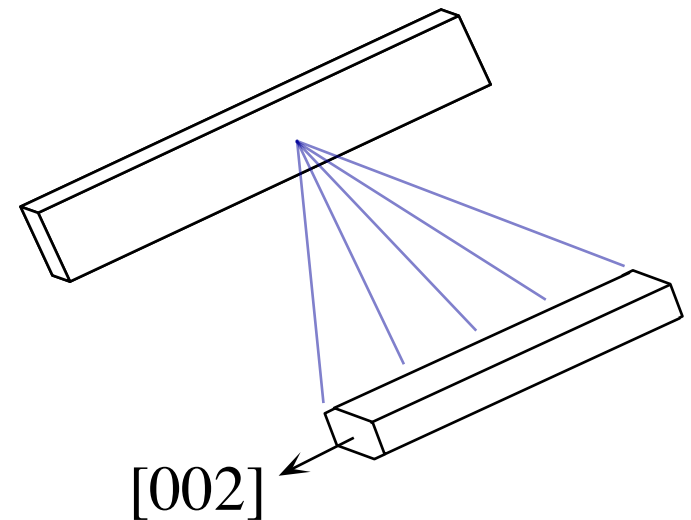


Converse, *et al.*, *Biomaterials*, 2007; Roeder *et al.*, *J. Biomed. Mater. Res.*, 2003

Preferred Orientation of HA Whiskers

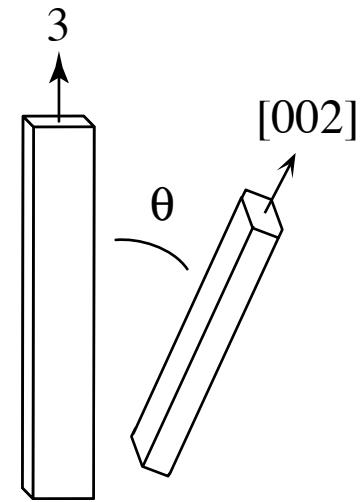
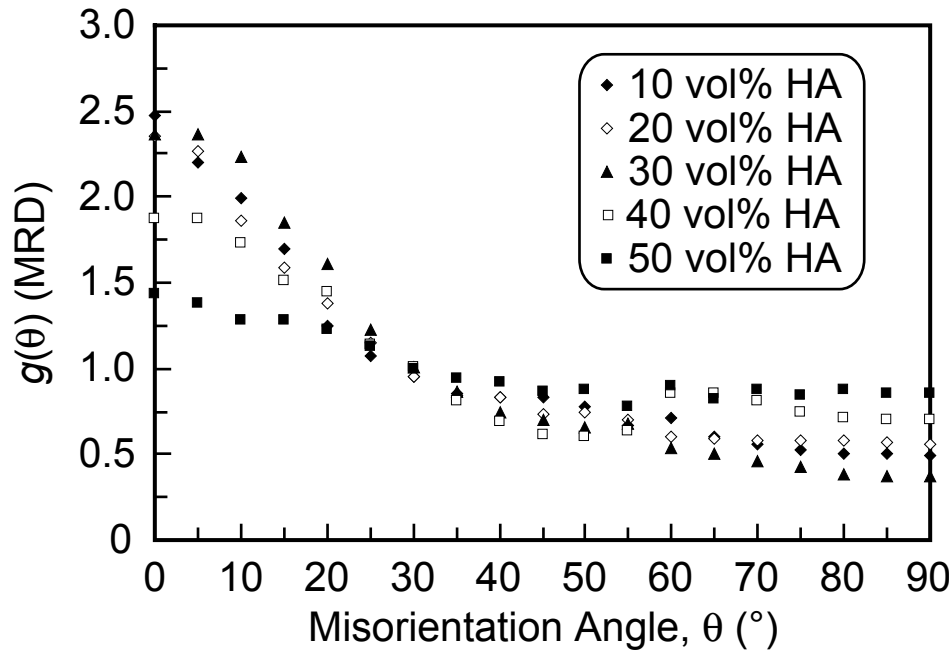


30 vol% HA whisker
reinforced HDPE

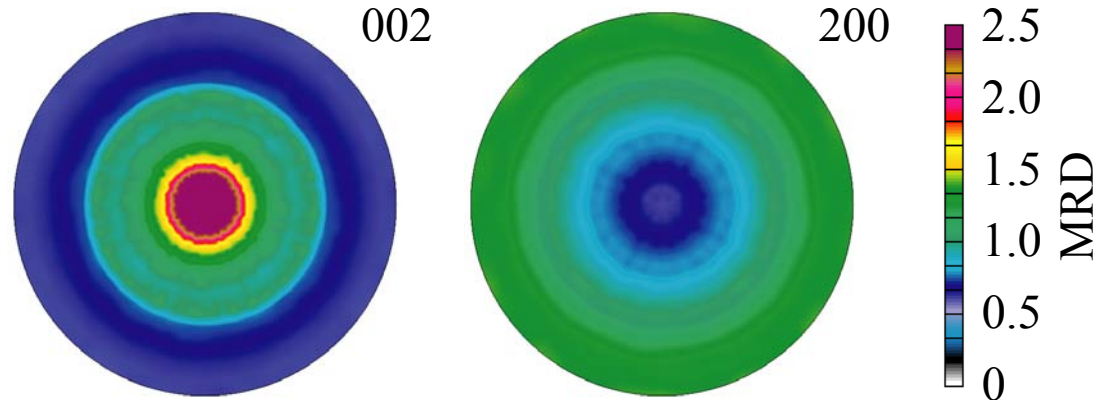


Roeder, *et al.*, *J. Biomed. Mater. Res.*, 2003

Preferred Orientation of HA Whiskers



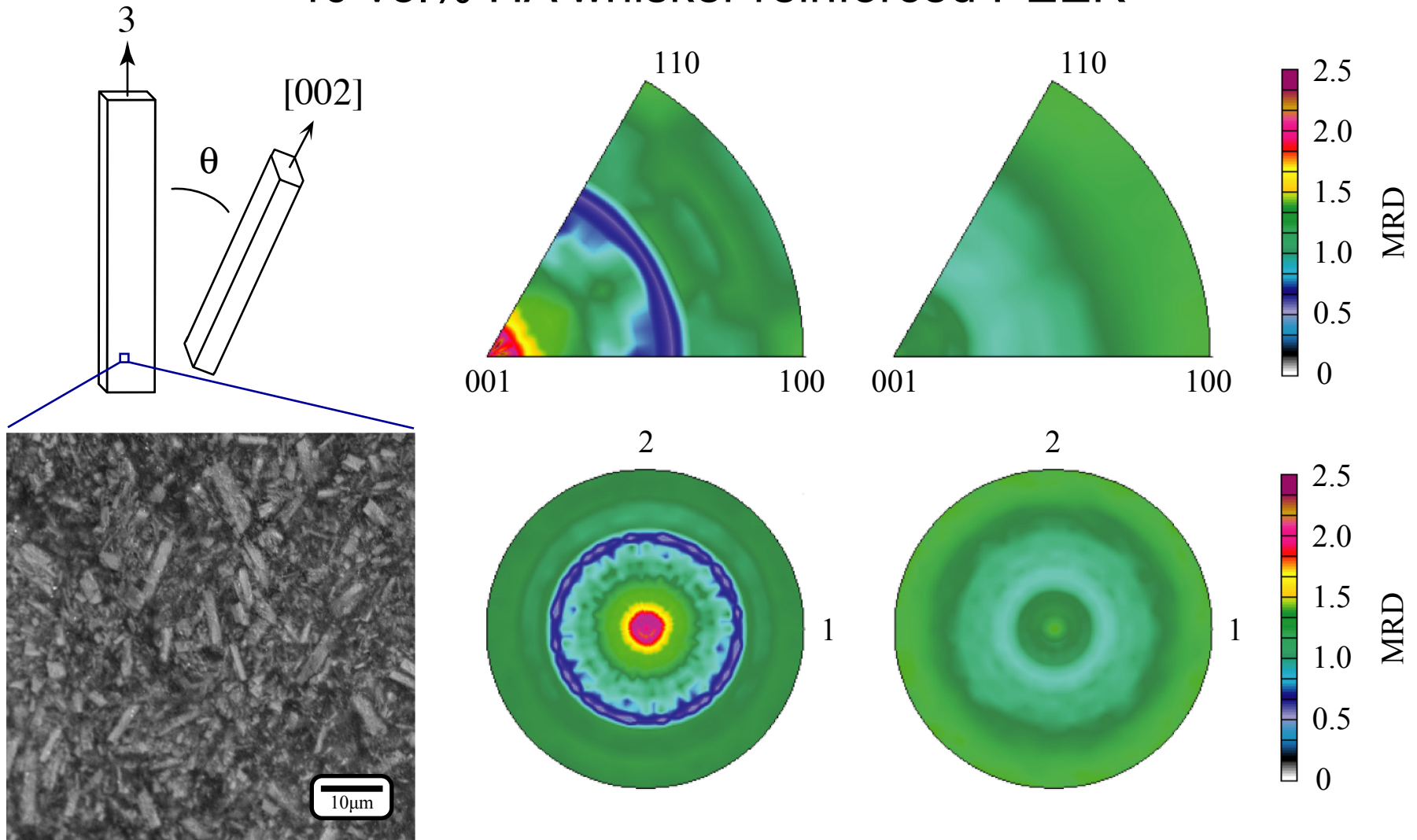
30 vol% HA whisker reinforced HDPE



Yue and Roeder, *J. Mater. Res.*, 2006

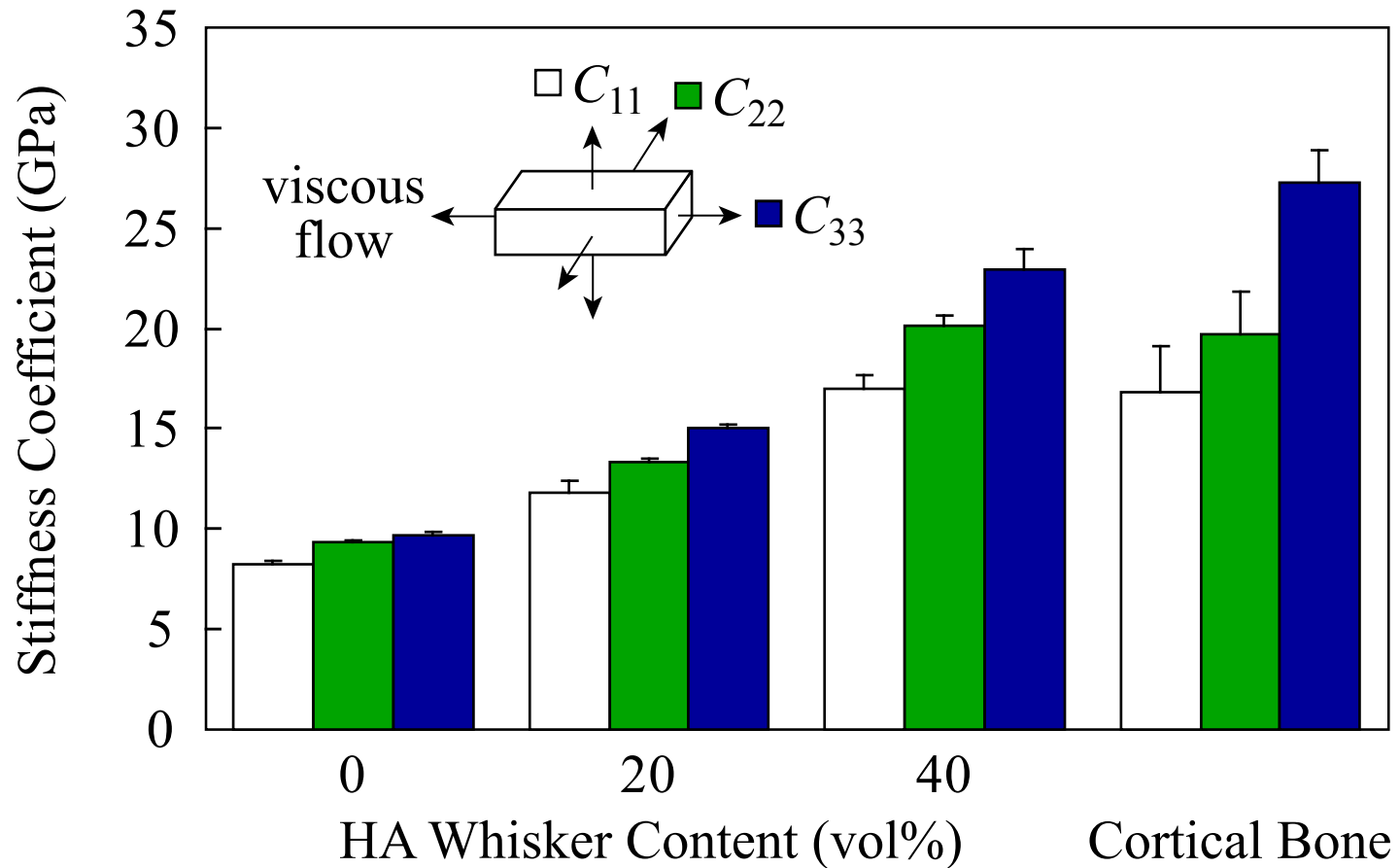
Preferred Orientation of HA Whiskers

40 vol% HA whisker reinforced PEEK



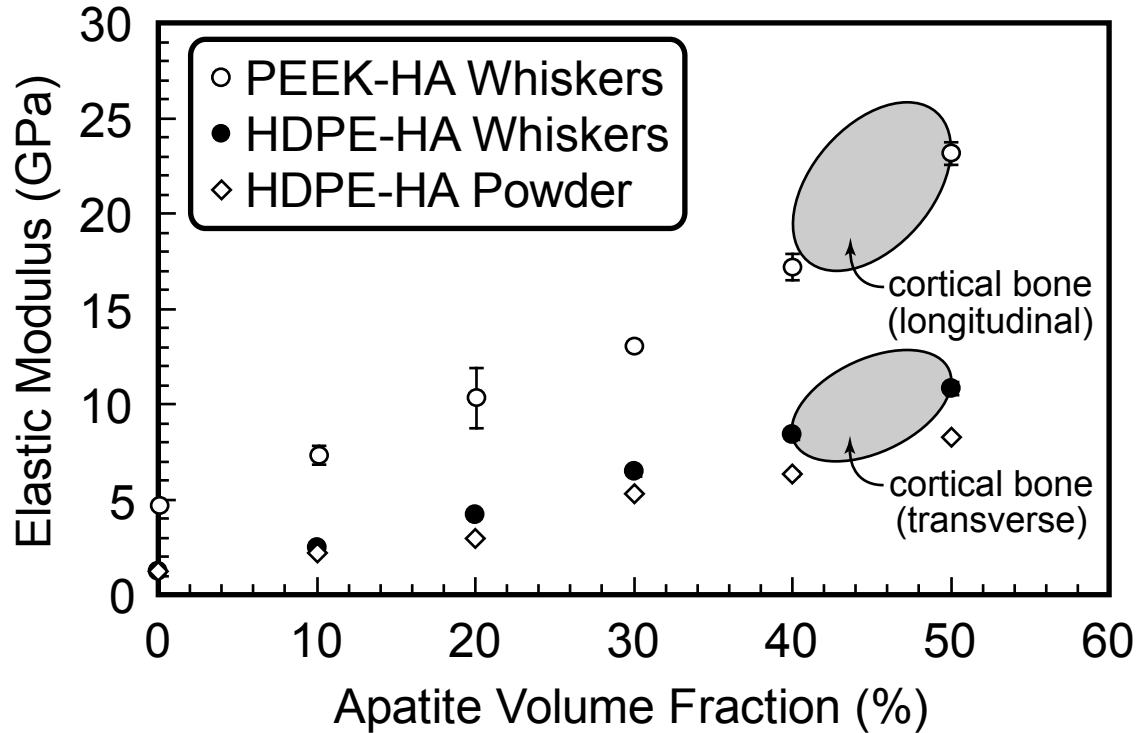
Converse, et al., *Biomaterials*, 2007

HA Whisker Reinforced PEEK

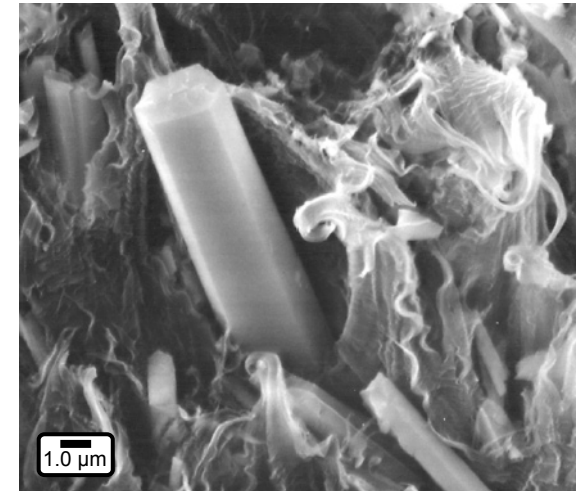


Converse, *et al.*, *Biomaterials*, 2007

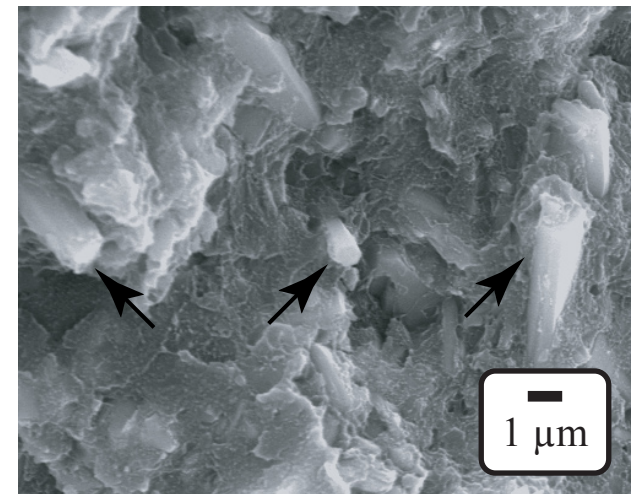
HA Whisker Reinforced Polymers



HA-HDPE



HA-PEEK

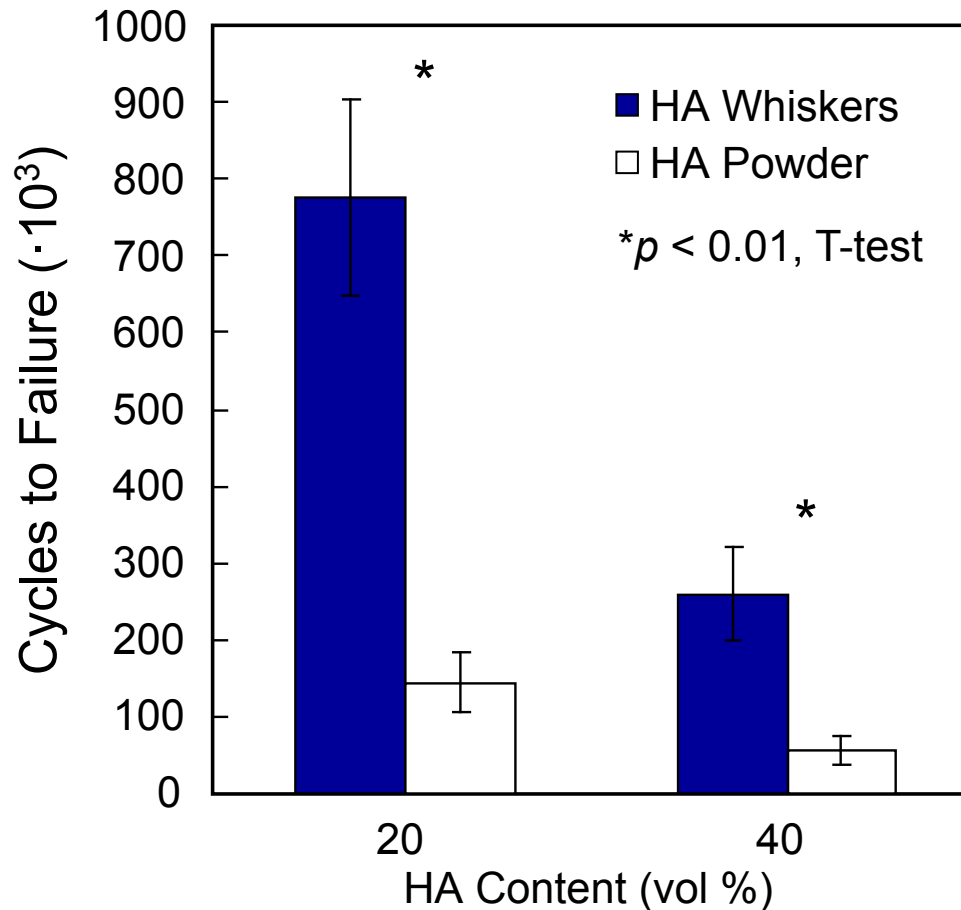


Converse, et al., *Biomaterials*, 2007

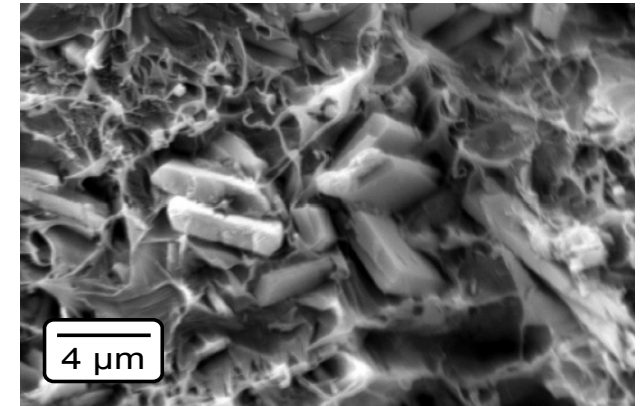
Roeder et al., *J. Biomed. Mater. Res.*, 2003

HA Whisker Reinforced HDPE

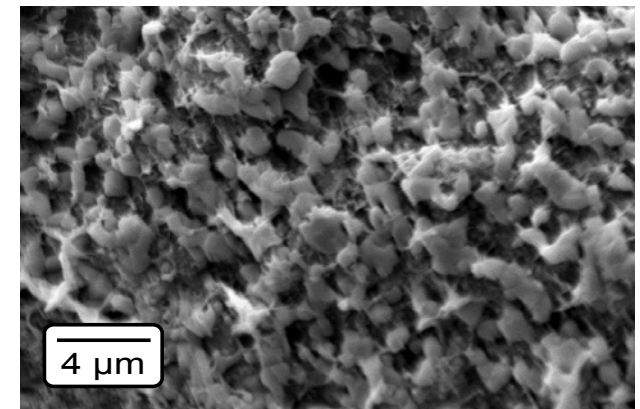
four point bending fatigue, 15 MPa at 2 Hz in PBS at 37°C



40 vol% HA Whiskers



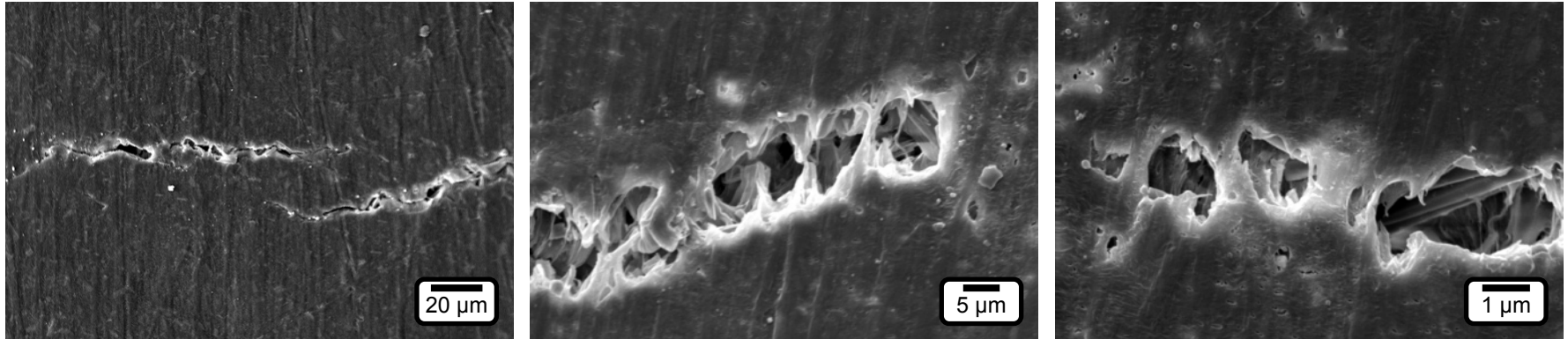
40 vol% HA Powder



Kane, et al., *J. Mech. Behav. Biomed. Mater.*, 2008

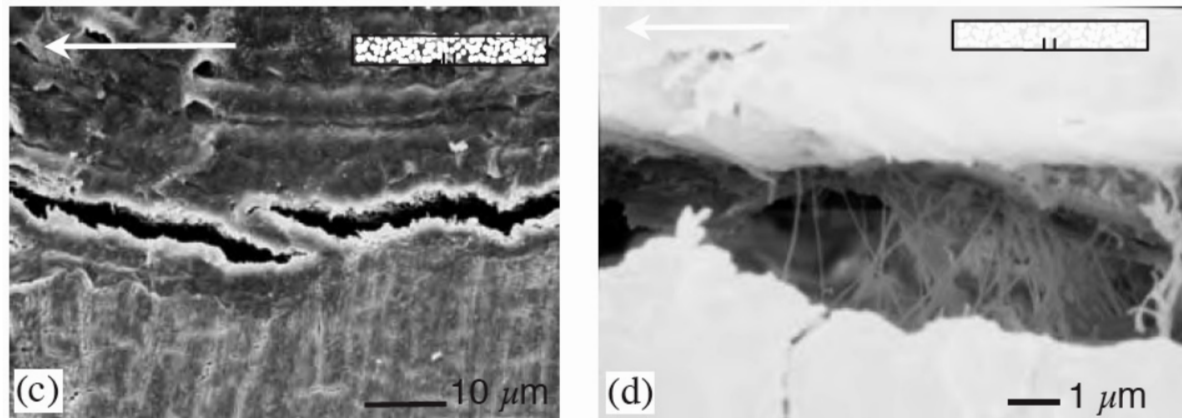
HA Whisker Reinforced HDPE

surface microcracks formed during fatigue loading



Kane, et al., J. Mech. Behav. Biomed. Mater., 2008

Bone



Nalla et al., J. Biomechanics, 2005