X-Ray Studies of a Gold Nanosphere Monolayer

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System Studied

- Gold nanosphere monolayers
Reflectivity

Graph Collection

Surface Layer Density=5
Surface Layer Length=55
Surface Layer MW=679
Surface Layer e- Count=401
Surface Layer Absorption=1e-5

Density of Subphase=0.996
Subphase Absorption=3e-8
Subphase MW=18
Subphase e- Count=10
X-Ray wavelength=1.24

Chi square=8.8925
Reflectivity Conclusions

• Roughness of surface was 4.6 Å

• Relative electron density of gold particles is about 6 times greater than water

• Width of electron density peak gives size of particle ~60 Å
GIXD: Raw Data

$Q_w$ range $= [0.946, 0.310] \quad \Omega_r$ range $= [-0.113, 0.586]$
GIXD: Analysis
GIXD: Analysis

Peak 1 \{1\ 0\}: Center at 0.103534 Å\(^{-1}\)
FWHM is 0.0179797 Å\(^{-1}\)

Peak 2 \{1\ 1\}: Center at 0.181368 Å\(^{-1}\)

FWHM gives coherence length

\[ d = \frac{2\pi}{q} \]

Gives nearest neighbor distance
GIXD: Conclusions

• Hexagonal Packing
• Center to center distance of 6.06 nm
• Coherence length of 30.88 nm
  – 5 particles
• $P_2/P_1 \sim \sqrt{3}$
• $P_3/P_1 \sim 2$

Implies hexagonal packing!
Acknowledgements

• Liquid Surface Scattering School
• Argonne National Lab
• Binhua Lin
• Mati Meron
• Jeff Gebhardt
• Steve Danauskas
• Ivan Kuzmenko
• Jane Andrew