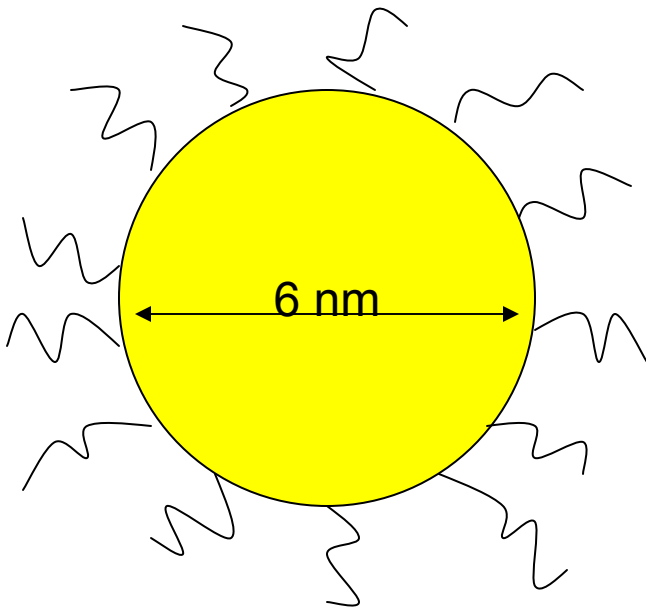


X-Ray Studies of a Gold Nanosphere Monolayer

Laura Hawk, Sumit Garg, Nouman
laanait, Curt DeCaro, Kathleen Cao,
Ben Stripe, Hao Yu, Ahmet Uysal,
Ashish Tripathi

System Studied

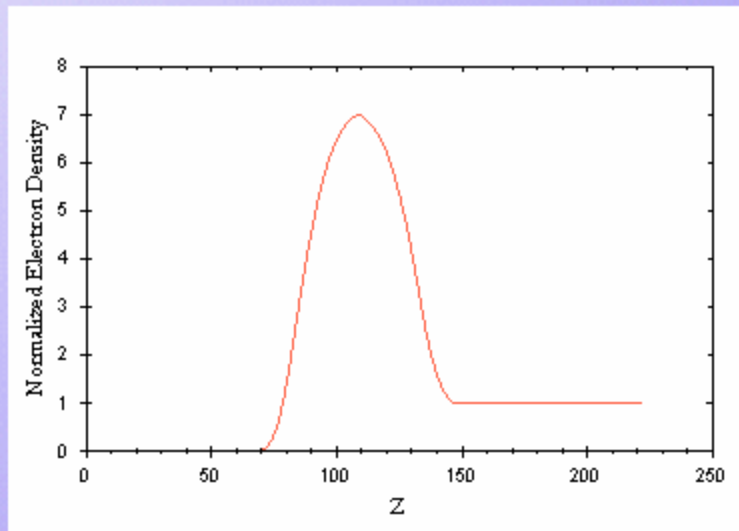
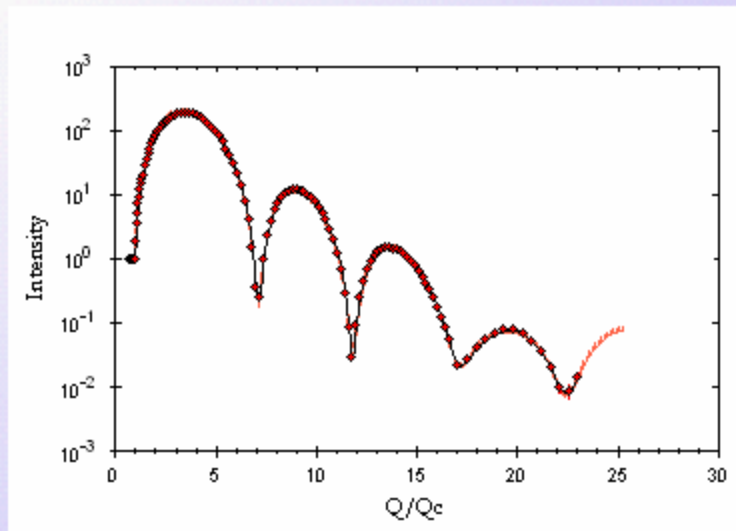
- Gold nanosphere monolayers



QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

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

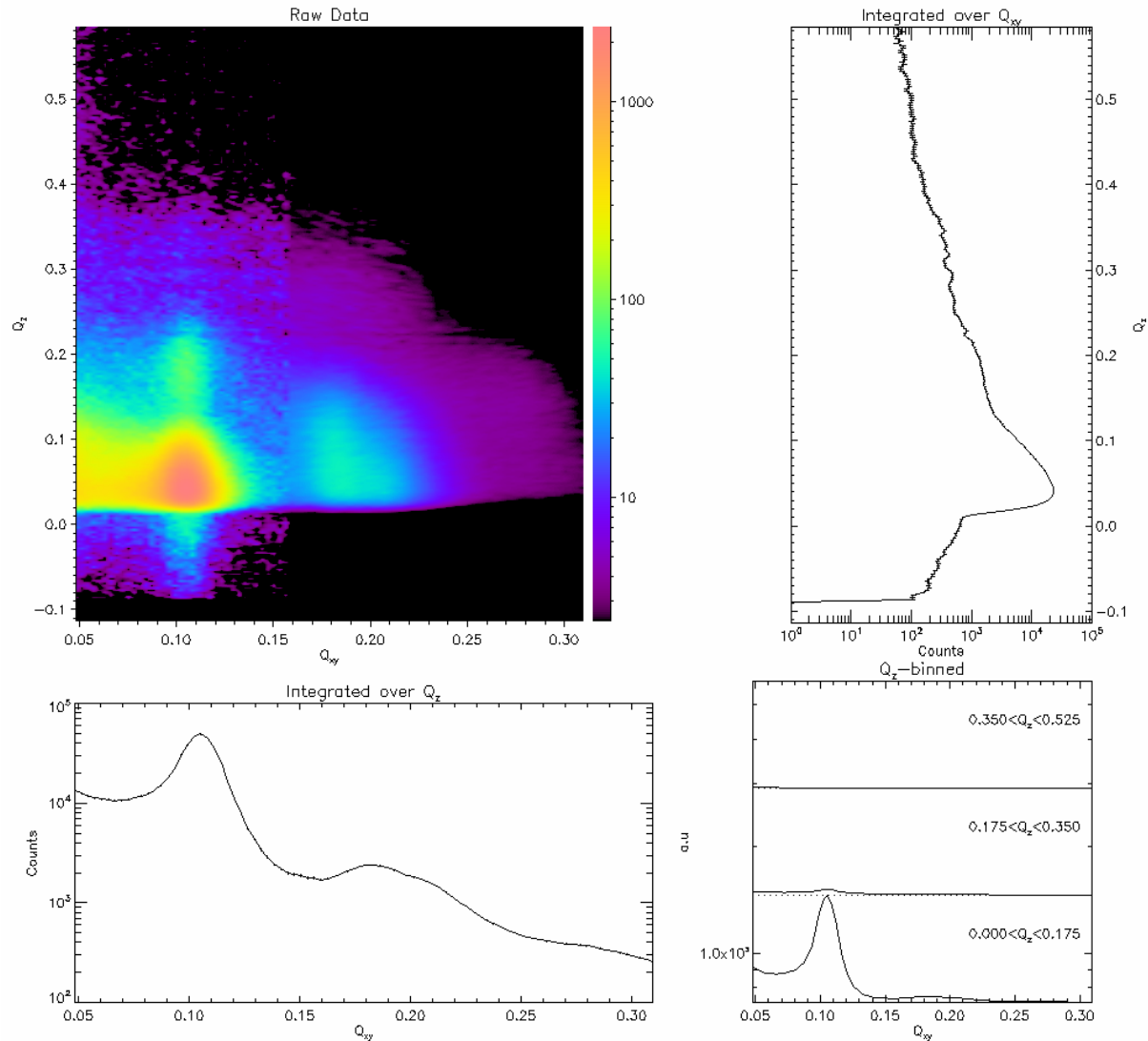
Chi square=8.8925

Reflectivity Conclusions

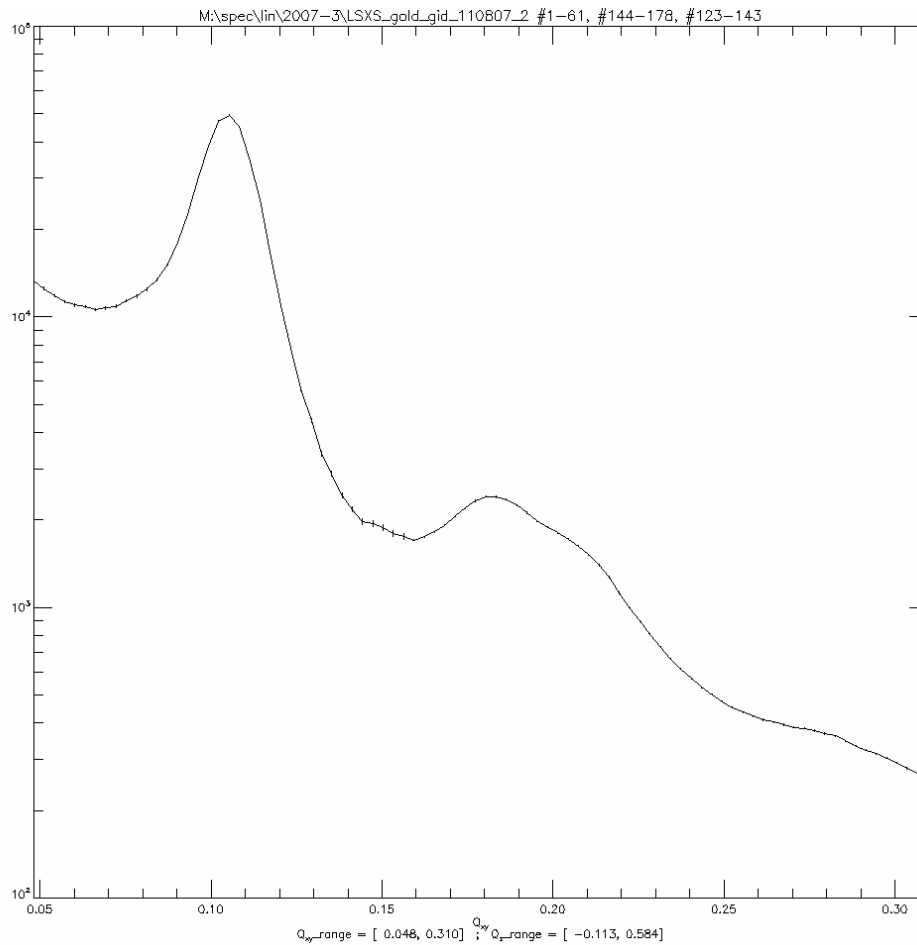
- Roughness of surface was 4.6 Å
- Relative electron density of gold particles is about 6 times greater than water
- Width of electron density peak gives size of particle ~60 Å

GIXD: Raw Data

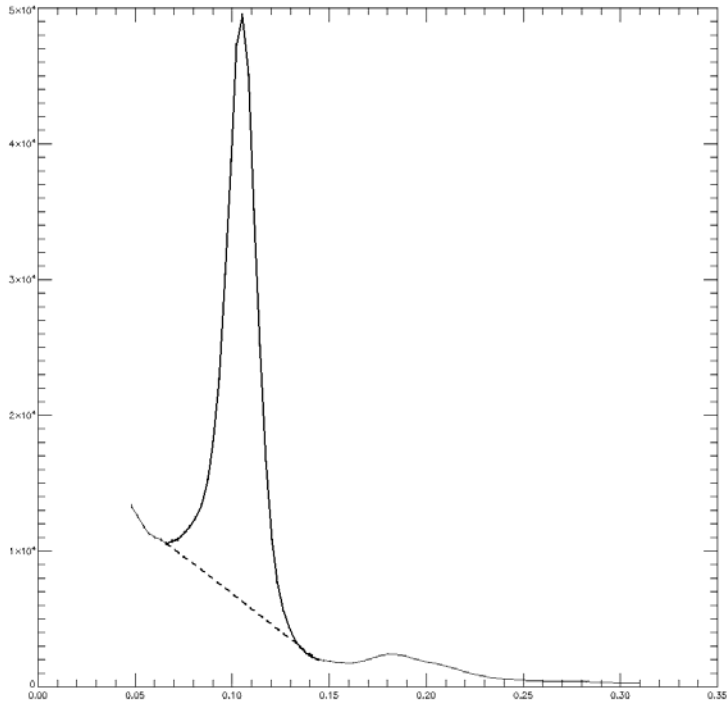
M:\spec\lin\2007-3\LSXS_gold_gid_110807_2 #1-61, #144-178, #123-143
 Q_y range = [0.048, 0.310] ; Q_z range = [-0.113, 0.584]



GIXD: Analysis



GIXD: Analysis



Peak 1 {1 0}:
Center at $0.103534 \text{ \AA}^{-1}$
FWHM is $0.0179797 \text{ \AA}^{-1}$

Peak 2 {1 1}:
Center at $0.181368 \text{ \AA}^{-1}$

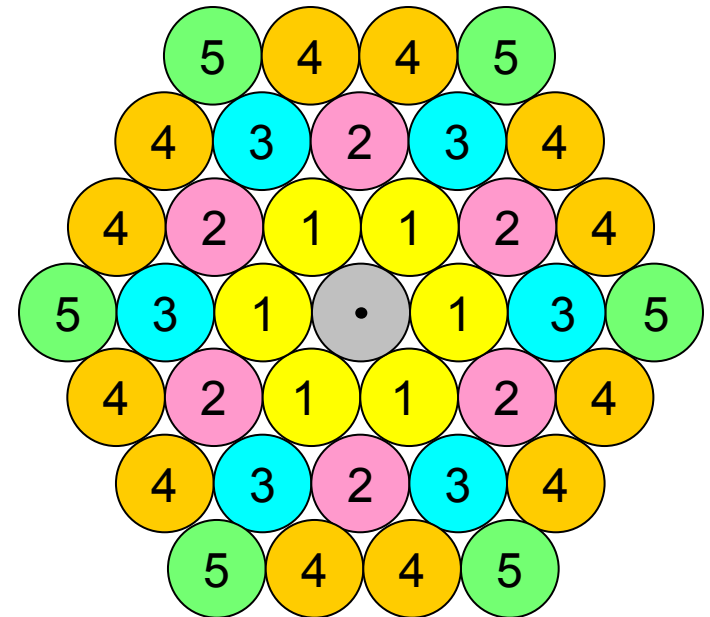
FWHM gives coherence length

$$d = 2\pi/q$$

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

