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Diffraction and Imaging Study of Imperfections of Protein Crystals with Coherent X-rays Z.W. Hu¹, B.R. Thomas¹, A.A. Chernov¹, Y.S. Chu², B. Lai², ¹SD-46/BAE, NASA/Marshall Space Flight Center, Huntsville, AL 35812, ²Argonne National Laboratory, Argonne, IL 60439

High angular-resolution X-ray diffraction and phase contrast x-ray imaging were combined to study defects and perfection of protein crystals. Imperfections including line defects, inclusions and other microdefects were observed in the diffraction images of a uniformly grown lysozyme crystal. The observed line defects carry distinct dislocation features running approximately along the $\langle 110 \rangle$ growth front and have been found to originate mostly in a central growth area and occasionally in outer growth regions. Slow dehydration led to the broadening of a fairly symmetric 440 rocking curve by a factor of ~ 2.6 , which was primarily attributed to the dehydration-induced microscopic effects that are clearly shown in diffraction images. X-ray imaging and diffraction characterization of the perfection of apoferritin crystals will also be discussed in the presentation.

[1] Z. W. Hu, B. Lai, Y. S. Chu, Z. Cai, D. C. Mancini, B. R. Thomas, A. A. Chernov, *Phys. Rev. Lett.* 148101-1---148101-4(2001)

[2] Z. W. Hu, Y. S. Chu, B. Lai, B. R. Thomas, A. A. Chernov, *Acta Cryst. D* 60, 621-629 (2004)