

ADC offers a High Pressure Cryo-Cooler for preparing protein crystals used for Crystallography experiment (HPC-201).



This device is into the fourth year of commercialization and has been used in Europe, Asia and the US. There have been great improvements made with each generation. The device's fundamental design is based on a process **developed by Cornell University scientists Prof. Sol M. Gruner and Prof. Chae Un Kim**. The technology enables the simultaneous capture of both amplitude and phase information from a single anomalous diffraction (SAD) of a cryocooled protein crystal, thereby providing sufficient data to solve the crystal structure of a protein with a previously unknown structure. Flash-freezing at atmospheric pressure requires the use of cryoprotectants. Finding the right cryoprotectant for each sample type can be a long, trial-and-error process. The High Pressure Cryo-Cooler eliminates the need to use cryoprotectants and produces superior results.

For the Newest Publications with Latest Cryo-Cooler Generation:

18. Hae Joo Kang, Neil G. Paterson, **Chae Un Kim**, Martin Middleditch, Chungyu Chang, Hung Ton-That and Edward N. Baker. [Slow-forming isopeptide bond in the structure of the major pilin SpaD from *Corynebacterium diphtheriae* has implications for pilus assembly. *Acta Cryst.*\(2014\) D70, 1190-1201.](#)
19. Enju Lima, Yuriy Chushkin, Peter van der Linden, **Chae Un Kim**, Federico Zontone, Philippe Carpentier, Sol M. Gruner, and Petra Pernot. [Cryogenic X-ray diffraction microscopy utilizing high-pressure cryopreservation. *Physical Review E* \(2014\) 90, 042713.](#)
20. **Chae Un Kim**, Mark W. Tate, and Sol M. Gruner. [Glass-to-cryogenic-liquid transitions in aqueous solutions suggested by crack healing. *Proc. Natl. Acad. Sci. USA* \(2015\) 112, 11765–11770.](#)
21. Qingqiu Huang, Sol M. Gruner, **Chae Un Kim**, Yuxin Mao, Xiaochun Wu, and Doletha M. E. Szebenyi. [Reduction of lattice disorder in protein crystals by high pressure cryocooling. *J. Appl. Cryst.* \(2016\) 49, 149-157.](#)
22. **Chae Un Kim**, Hyo Jin Song, Balendu S. Avvaru, Sol M. Gruner, Sang Youn Park, and Robert McKenna. [Tracking solvent and protein movement during CO₂ release in carbonic anhydrase II crystals. *Proc. Natl. Acad. Sci. USA* \(2016\) 113, 5257-5262.](#)
23. **Jin Kyun Kim**, Carrie L. Lomelino, Balendu Sankara Avvaru, Brian P. Mahon, Robert McKenna, SangYoun Park and **Chae Un Kim**. [Active site solvent replenishment observed during human carbonic anhydrase II catalysis, *IUCrJ* \(2018\) 5, 93-102.](#)

Earlier Publications:

1. **Chae Un Kim**, Raphael Kapfer and Sol M. Gruner. [High pressure cooling of protein crystals without cryoprotectants, *Acta Cryst.* \(2005\) D61, 881-890.](#)
2. **Chae Un Kim**, Quan Hao and Sol M. Gruner. [Solution of protein crystallographic structures by high pressure cryocooling and noble gas phasing, *Acta Cryst.* \(2006\) D62, 687-694.](#)
3. Ronald A. Albright, Jose-Luis Vazquez Ibar, **Chae Un Kim**, Sol M. Gruner and Joao Henrique Morais-Cabral. [The RCK domain of the KtrAB K⁺ transporter: multiple conformations of an octameric ring, *Cell* \(2006\) 126, 1147-1159.](#)



4. [Chae Un Kim, Quan Hao and Sol M. Gruner. High pressure cryocooling for capillary sample cryoprotection and diffraction phasing at long wavelengths, *Acta Cryst.* \(2007\) D63, 653-659.](#)
5. [Chae Un Kim, Yi-Fan Chen, Mark W. Tate and Sol M. Gruner. Pressure induced high-density amorphous ice in protein crystals, *J. Appl. Cryst.* \(2008\) 41, 1-7.](#)
6. [Buz Barstow, Nozomi Ando, Chae Un Kim and Sol M. Gruner. Alteration of citrine structure by hydrostatic pressure explains the accompanying spectral shift, *Proc. Natl. Acad. Sci. USA* \(2008\) 105, 13362-13366.](#)
7. [John F. Domsic, Balendu Sankara Avvaru, Chae Un Kim, Sol M. Gruner, Mavis Agbandje-McKenna, David N. Silverman and Robert McKenna. Entrapment of carbon dioxide in the active site of carbonic anhydrase II, *J. Biol. Chem.* \(2008\) 283, 30766-30771.](#)
8. [Chae Un Kim, Buz Barstow, Mark W. Tate and Sol M. Gruner. Evidence for liquid water during the high-density to low-density amorphous ice transition, *Proc. Natl. Acad. Sci. USA* \(2009\) 106, 4596-4600.](#)
9. [Buz Barstow, Nozomi Ando, Chae Un Kim and Sol M. Gruner. Coupling of pressure-induced structural shifts to spectral changes in a yellow fluorescent protein, *Biophys. J.* \(2009\) 97, 1719-1727.](#)
10. [Balendu S. Avvaru, Chae Un Kim, Katherine H. Sippel, Sol M. Gruner, Mavis Agbandje-McKenna, David N. Silverman and Robert McKenna. A short, strong hydrogen bond in the active site of human carbonic anhydrase II, *Biochemistry* \(2010\) 49, 249-251.](#)
11. [Ulrich Englich, Irina A. Kriksunov, Richard A. Cerione, Michael J. Cook, Richard Gillilan, Sol M. Gruner, Qingqui Huang, Chae Un Kim, William Miller, Søren Nielsen, David Schuller, Scott Smitha and Dolettha M. E. Szebenyi. Microcrystallography, high pressure cryocooling and BioSAXS at MacCHESS, *J. Synchrotron Radiat.* \(2011\) 18, 70-73.](#)
12. [Marcus D. Collins, Chae Un Kim, and Sol M. Gruner. High-pressure protein crystallography and NMR to explore protein conformations, *Annu. Rev. Biophys.* \(2011\) 40, 81-98.](#)
13. [Chae Un Kim*, Mark W. Tate and Sol M. Gruner. Protein dynamical transition at 110 K, *Proc. Natl. Acad. Sci. USA* \(2011\) 108, 20897-20901.](#)
14. [Dayne West, Chae Un Kim, Chingkuang Tu, Jim Gordon, Arthur H. Robbins, Sol M. Gruner, David N. Silverman, and Robert McKenna. Structural and kinetic effects on changes in the CO₂ binding pocket of human carbonic anhydrase II, *Biochemistry* \(2012\) 51, 9156–9163.](#)
15. [Chae Un Kim*, Jennifer L. Wierman, Richard Gillilan, Enju Lima, Sol M. Gruner. A high pressure cryocooling method for protein crystals and biological samples with reduced background X-ray scatter, *J. Appl. Cryst.* \(2013\) 46, 234-241.](#)
16. [Jennifer L. Wierman, Jonathan S. Alden, Chae Un Kim, Paul L. McEuen and Sol M. Gruner, Graphene as a protein crystal mounting material to reduce background scatter, *J. Appl. Cryst.* \(2013\) 46, 1501-1506.](#)
17. [Angela V. Toms, Anagha Deshpande, Randall McNally, Youngjee Jeong, Julia M. Rogers, Sol M. Gruner, Chae Un Kim, Scott B. Ficarro, Jarrod A. Marto, Martin Sattler, James D. Griffin, Michael J. Eck. Structure of a pseudokinase domain switch that controls activation of Jak kinases, *Nat. Struct. Mol. Biol.* \(2013\) 20, 1221-1223.](#)