

Oct 02, 2024

🌐 Crystallisation of SARS-CoV-2 N Protein



Forked from [Crystallization of SARS-CoV-2 N Protein](#)

DOI

dx.doi.org/10.17504/protocols.io.8epv5r8ydg1b/v1



Peter Marples^{1,2}, Lizbé Koekemoer³, Daren Fearon^{1,2}

¹Diamond Light Source; ²Research Complex at Harwell; ³Centre of Medicines Discovery, University of Oxford

ASAP Discovery



Peter Marples

Diamond Light Source

OPEN ACCESS



DOI: dx.doi.org/10.17504/protocols.io.8epv5r8ydg1b/v1

External link: <https://asapdiscovery.org/outputs/target-enabling-packages/#ASAP-SARS-COV-2-NPROTEIN>

Protocol Citation: Peter Marples, Lizbé Koekemoer, Daren Fearon 2024. Crystallisation of SARS-CoV-2 N Protein. protocols.io
<https://dx.doi.org/10.17504/protocols.io.8epv5r8ydg1b/v1>

License: This is an open access protocol distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working

We use this protocol and it's working

Created: October 02, 2024

Last Modified: October 02, 2024

Protocol Integer ID: 108829

Keywords: crystallisation, XChem, ASAP, AViDD, CMD, Diamond Light Source, i04-1, SARS CoV-2 Nucleocapsid, Nucleocapsid, N-protein, Research complex at Harwell

Funders Acknowledgement:

National Institutes of
Health/National Institute Of
Allergy and Infectious
Diseases (NIH/NIAID)
Grant ID: Grant ID:
U19AI171399

Disclaimer

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Acknowledgements:


Diamond Light Source Ltd, Harwell Science and Innovation Campus, Didcot OX11 0QX, UK
Research Complex at Harwell, Harwell Science and Innovation Campus, Didcot OX11 0FA, UK
Oxford Lab Technologies crystal shifter <https://doi.org/10.1107/S2059798320014114>


Abstract

The crystallization protocol and buffer conditions used to obtain reproducible SARS CoV-2 Nucleocapsid crystals suitable for **XChem** fragment screening.

Materials


SwissCI 3 lens crystallization plates <https://swissci.com/product/3-lens-crystallisation-plate/> **Codes:**
Midi: UVXPO-3LENS 3W96T-PS 3W96T-UVP

[M] 1 Molarity (M) HEPES adjusted to  7.8 with NaOH, Molecular Dimensions, Catalog # MD2-011-PH 7.8
70 % isopropanol, Sigma Aldrich, Catalog # **563935**
50% w/v PEG 4000, Molecular Dimensions, Catalog # MD2-250-11

Purified SARS CoV-2 Nucleocapsid protein ([M] 20 mg/mL) in [M] 10 millimolar (mM) HEPES,  7.5 ,
[M] 0.5 Molarity (M) NaCl, 5% glycerol, [M] 0.5 millimolar (mM) TCEP

Construct used protein residues 250-364

Safety warnings

 Follow all handling warning for the chemicals used in the crystallisation screen composition.

Equipment needed

- 1 **Formulatrix Rock Imager** (or incubator of choice)
SPT mosquito

Equipment

Mosquito HV

NAME

High Volume 16-Channel Robotic Liquid Handler

TYPE

SPT LabTech

BRAND

3097-01057

SKU

<https://www.sptlabtech.com/products/liquid-handling/mosquito-hv/>^{LINK}

P100 8 multi-channel pipette

SwissCI 3 lens plate

Crystallisation experiment

1d

- 2 **Prepare seed stock:**

Protocol



NAME

Diamond XChem Seeding Protocol

CREATED BY

Peter Marples

PREVIEW

1: 100 dilution  Sample seeds

- 3 **Protein and buffer requirements:**



57.6 µL



IM1 20 mg/mL



Sample



🧪 2.88 mL Crystallization screen

🧪 5.76 µL Sample seeds, dilution 1:100

4 Crystallisation screen composition:

[M] 0.1 Molarity (M) HEPES 7.8

10 % isopropanol

23% w/v PEG 4000

Stock solutions used:

[M] 1 Molarity (M) HEPES adjusted to 7.8 with NaOH

70 % isopropanol

50% w/v PEG 4000

Note

The crystallisation screen can be stored in a duran bottle or aliquoted into 96 deep well block for easy dispensing into SwissCI 3 lens plates.

For long term storage keep the Crystallisation screen in the fridge at 4°C.

5 Dispense 30 µL Crystallisation screen into SwissCI 3 lens plate reservoir wells using a 100 µl multi-channel pipette.

Dispense 200 nL [M] 20 mg/mL Sample to each lens using the SPT mosquito.

Dispense 180 nL Crystallisation screen to each lens using the SPT mosquito.

Dispense 20 nL Seeds to each lens using the SPT mosquito.

Drop ratio: 5:9:1 ratio (100 nL Sample : 180 nL reservoir solution: 20 nL seeds)

Final drop volume: 300 nL

6 Incubate at 20 °C for 24:00:00 h in Formulatrix Rock Imager.

1d

Imaging Schedule: The first images are taken after 12 h and the imaging schedule follows a Fibonacci sequence of days for further collections.

7 Crystal form after ~12 h.

Expected result

The crystals reach their maximum size after 24 h.

Crystals typically form as single crystals as six sided shards

Morphology: six sided shard

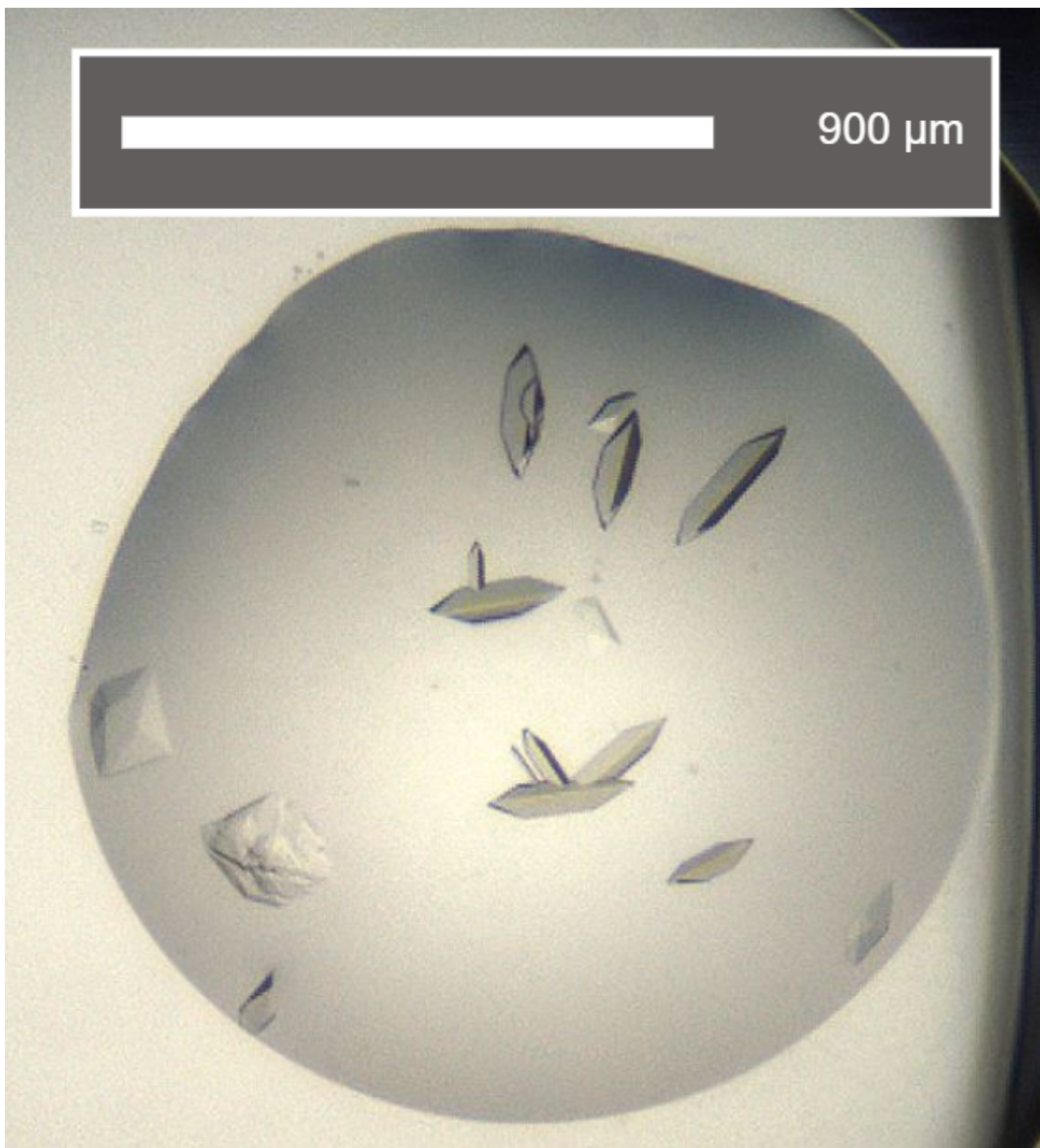
Size: ~100 μm in length and ~30 μm in width, depth of the crystals is ~30 μm

Appearance: glass shard.

Average resolution: 2.0 \AA

Space group: $I4_1$

Unit cell: 89, 89, 40
90.00°, 90.00°, 90.00°



An example of a drop containing SARS N-protein crystals.



Data collection at Synchrotron

- 8 Diamond Light Source
Unattended Data Collection (UDC)
Data Collection Temperature: 100K
Detector: DECTRIS EIGER2 X 9M
Beamline: I04-1
Wavelength: 0.9212 Å
Resolution (Å): 1.68
Beam Size (µm): 60 X 50
Number of images: 3600
Oscillation: 0.10°
Exposure (s): 0.0020
Transmission (%): 100
Flux (ph/s): 9.50e+11

Protocol references

N/A