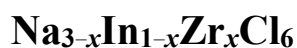


## Supporting Information

-

### On the influence of the coherence length on the ionic conductivity in mechanochemically synthesized sodium-conducting halides,



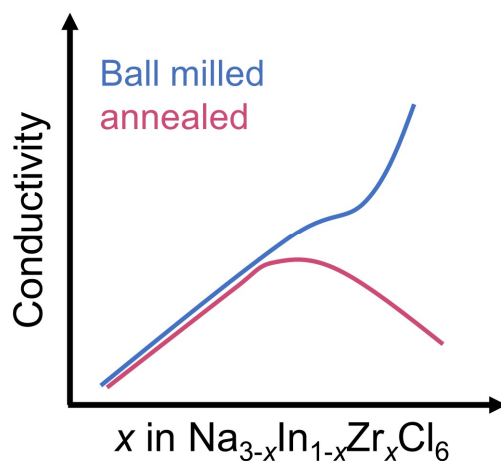
Tong Zhao,<sup>a,b</sup> Alexander N. Sobolev,<sup>a</sup> Xabier Martinez de Irujo Labalde,<sup>a</sup> Marvin A. Kraft,<sup>c</sup>  
Wolfgang G. Zeier<sup>\*a,c</sup>

<sup>a</sup>*Institute of Inorganic and Analytical Chemistry, University of Münster, Corrensstrasse  
28/30, 48149 Münster, Germany.*

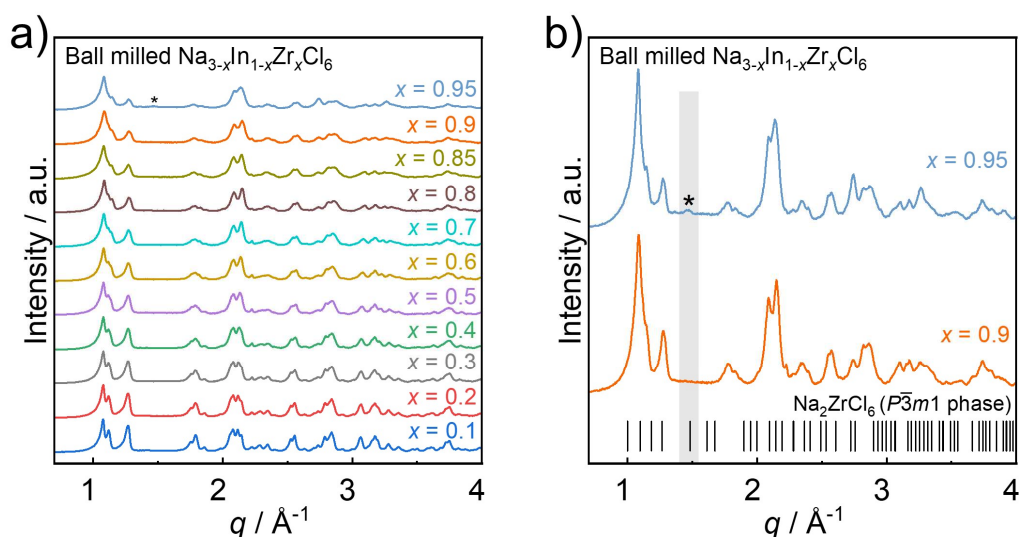
<sup>b</sup>*International Graduate School of Battery Chemistry, Characterization, Analysis, Recycling  
and Application (BACCARA), University of Münster, 48149 Münster, Germany*

<sup>c</sup>*Institut für Energie- und Klimaforschung (IEK), IEK-12: Helmholtz-Institut Münster,  
Forschungszentrum Jülich, 48149 Münster, Germany.*

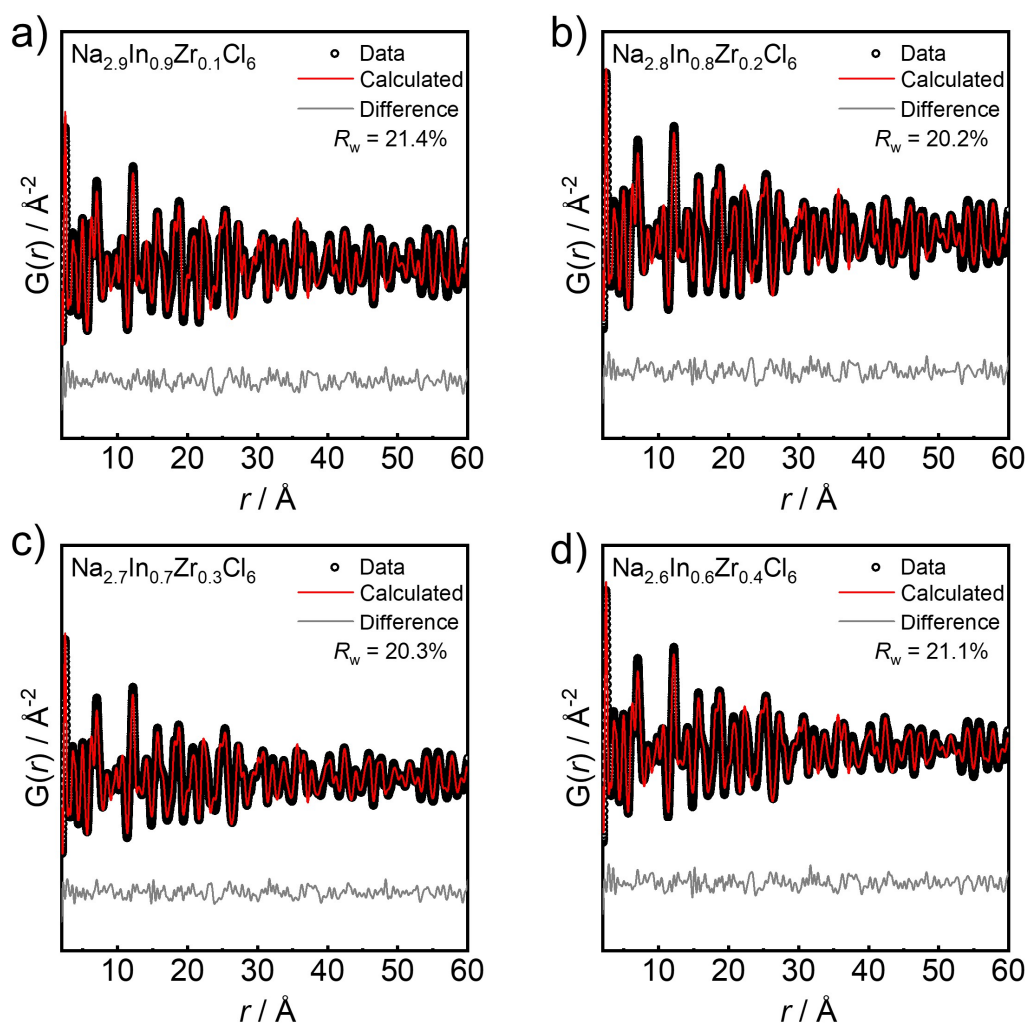
\*wzeier@uni-muenster.de



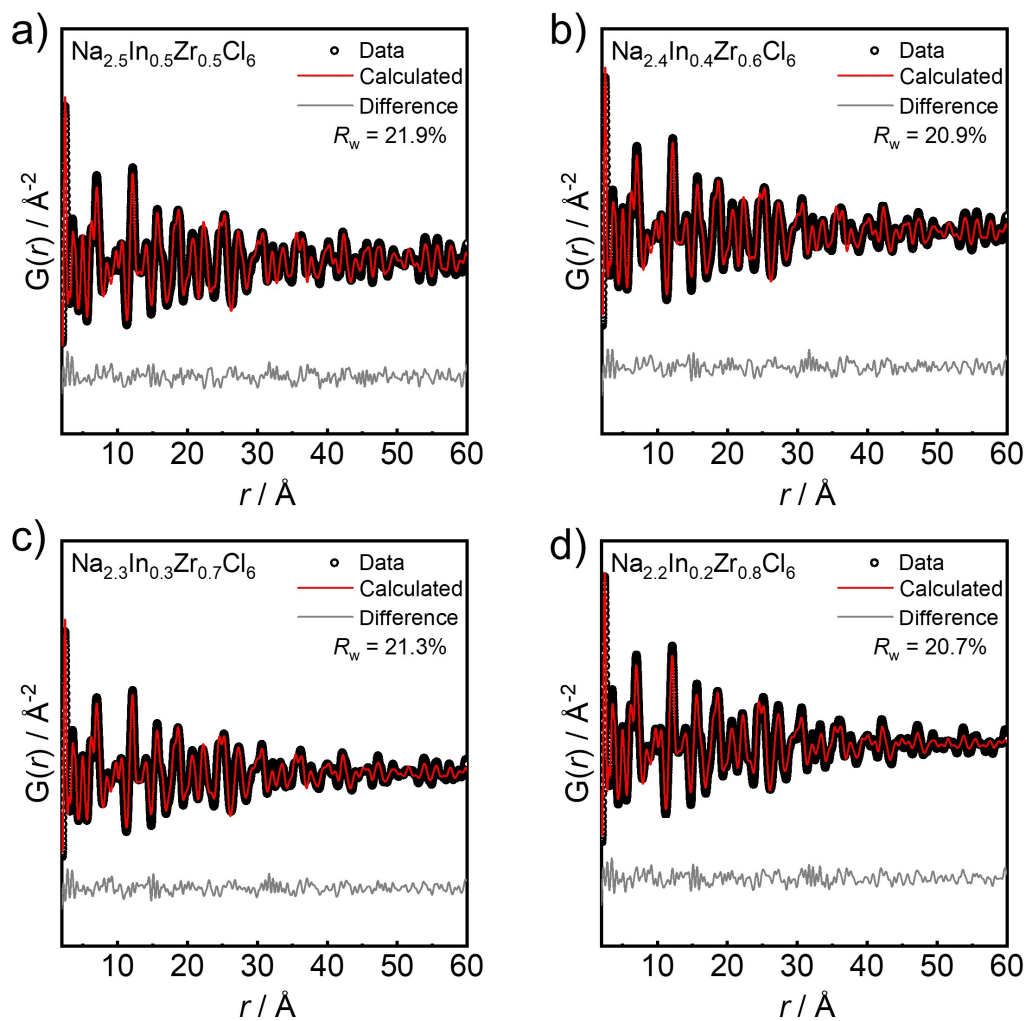
**Fig. S1.** Schematic of the differing trends of ionic conductivity against Zr content between ball milled and subsequently annealed  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$ .



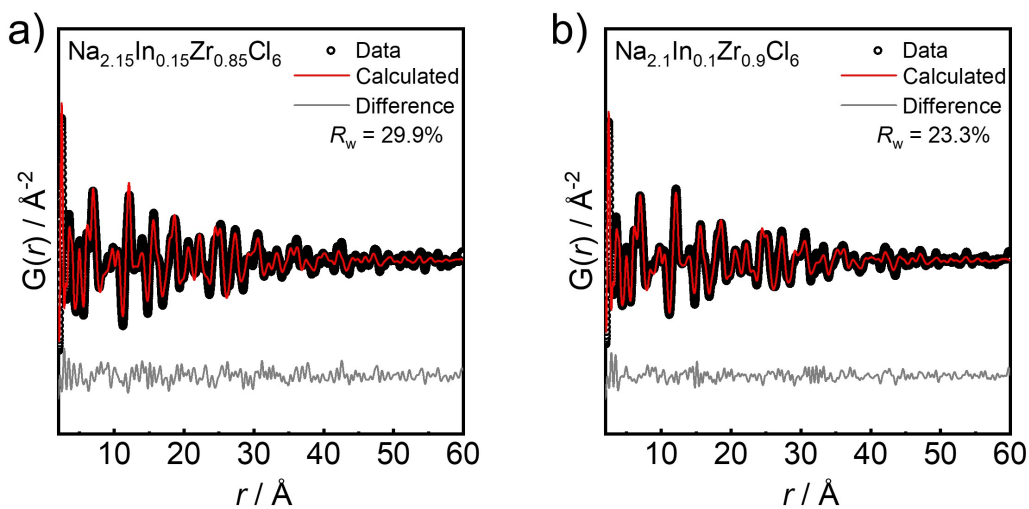
**Fig. S2.** **a)** X-ray diffraction patterns under  $\text{Ag K}\alpha_1$  radiation of the ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  series. **b)** Comparison of X-ray diffraction patterns of  $\text{Na}_{2.05}\text{In}_{0.05}\text{Zr}_{0.95}\text{Cl}_6$  and  $\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$  with reflections of the trigonal phase of  $\text{Na}_2\text{ZrCl}_6$  (space group  $P\bar{3}m1$ ). The dominant additional side-phase reflection ( $\sim 1.47 \text{\AA}^{-1}$ ) is marked with an asterisk (\*).



**Fig. S3.** Summary of pair distribution function fitting results of ball milled **a)**  $\text{Na}_{2.9}\text{In}_{0.9}\text{Zr}_{0.1}\text{Cl}_6$ , **b)**  $\text{Na}_{2.8}\text{In}_{0.8}\text{Zr}_{0.2}\text{Cl}_6$ , **c)**  $\text{Na}_{2.7}\text{In}_{0.7}\text{Zr}_{0.3}\text{Cl}_6$ , **d)**  $\text{Na}_{2.6}\text{In}_{0.6}\text{Zr}_{0.4}\text{Cl}_6$ .

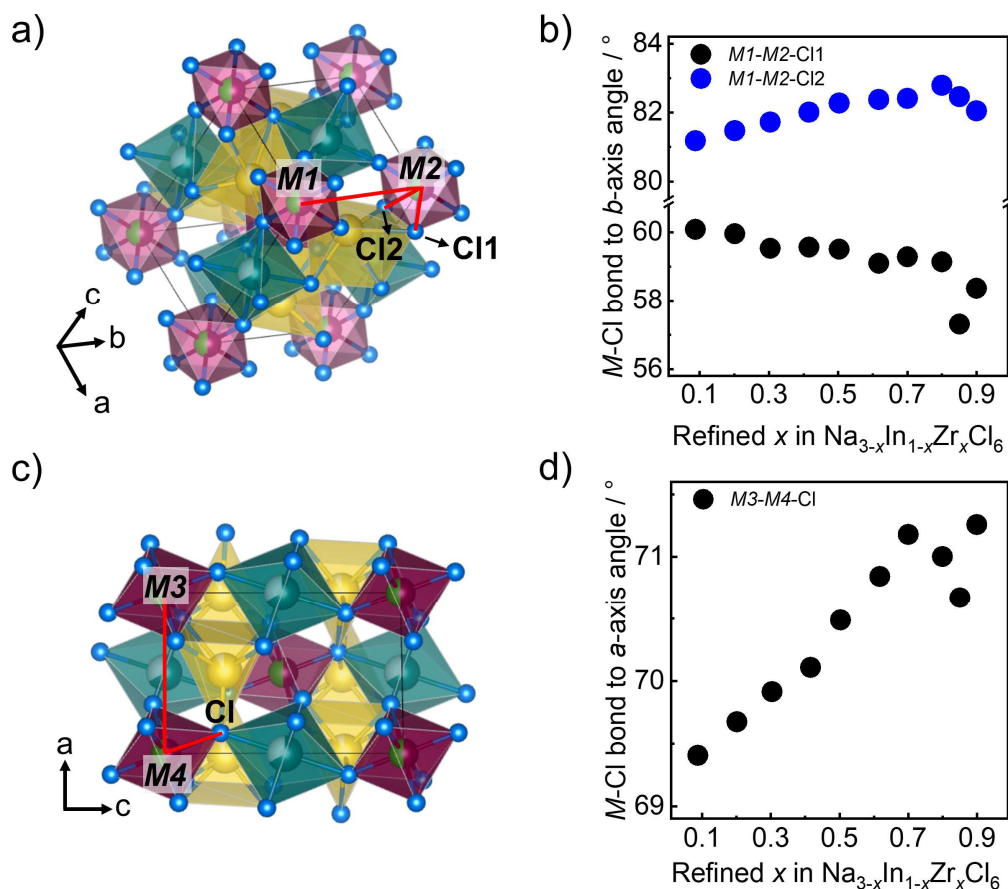


**Fig. S4.** Summary of pair distribution function fitting results of ball milled **a)**  $\text{Na}_{2.5}\text{In}_{0.5}\text{Zr}_{0.5}\text{Cl}_6$ , **b)**  $\text{Na}_{2.4}\text{In}_{0.4}\text{Zr}_{0.6}\text{Cl}_6$ , **c)**  $\text{Na}_{2.3}\text{In}_{0.3}\text{Zr}_{0.7}\text{Cl}_6$ , **d)**  $\text{Na}_{2.2}\text{Zr}_{0.2}\text{In}_{0.8}\text{Cl}_6$ .

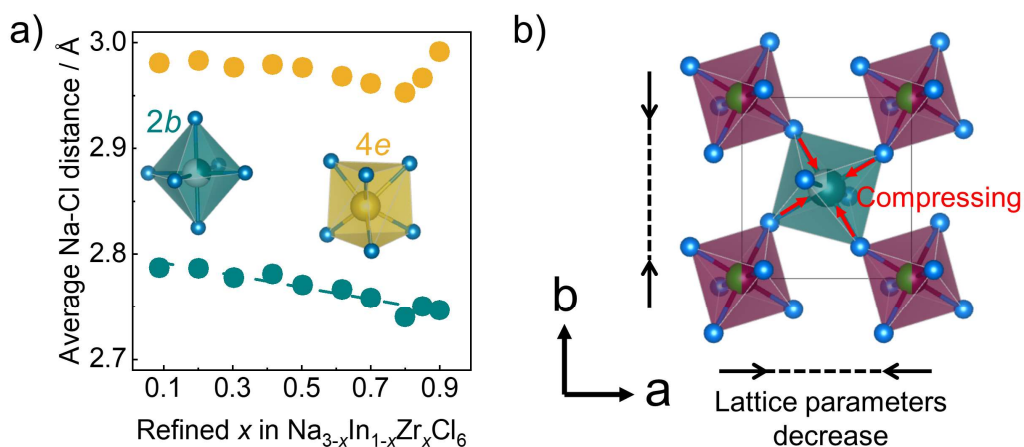


**Fig. S5.** Summary of pair distribution function fitting results of ball milled **a)**  $\text{Na}_{2.15}\text{In}_{0.15}\text{Zr}_{0.85}\text{Cl}_6$ ,

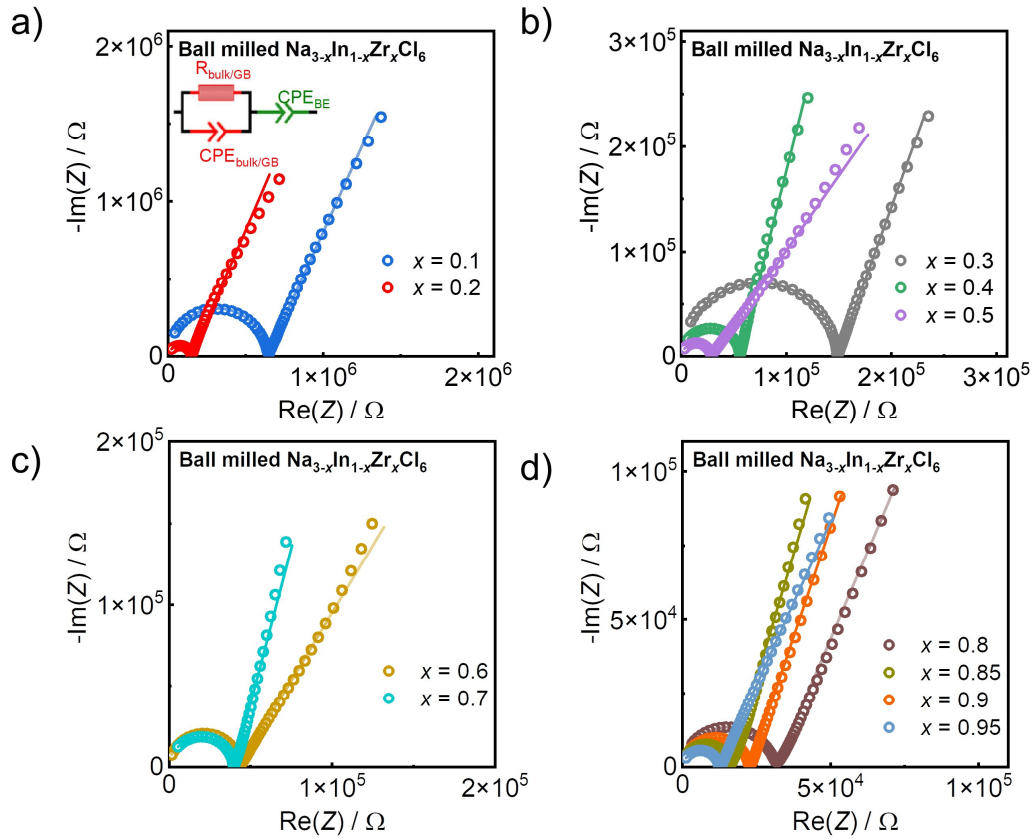
b)  $\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$ .



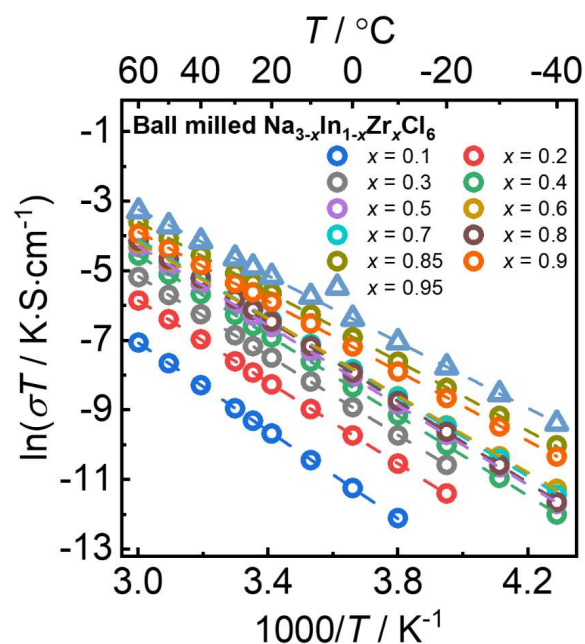
**Fig. S6.** *a)* Schematic of the angles between *b* axis (parallel to M1-M2 direction) and M-Cl bond (M, M1, M2 = In; Zr). *b)* Angles between the *b* axis and M-Cl bond as a function of refined Zr content. *c)* Schematic of the angles between *a* axis (parallel to M3-M4 direction) and M-Cl bond (M, M3, M4 = In; Zr). *d)* Angles between *a* axis and M-Cl bond as a function of refined Zr content.



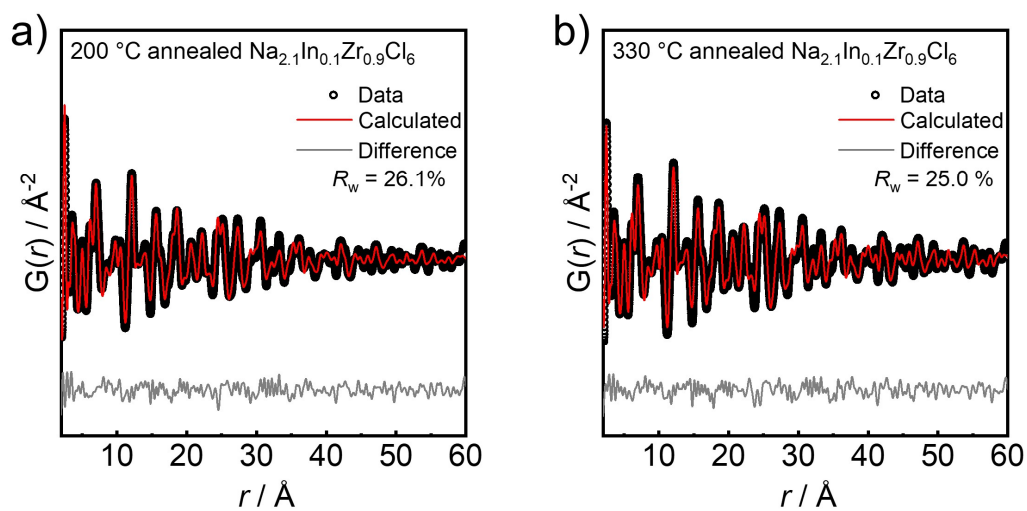
**Fig. S7.** *a)* Average Na-Cl distances of  $\text{NaCl}_6^{5-}$  octahedra ( $\text{Na}^+$  at Wyckoff *2b* site) and prism ( $\text{Na}^+$  at Wyckoff *4e* site). Dashed lines correspond to linear behavior as guides-to-the-eye. *b)* Schematics of  $\text{NaCl}_6^{5-}$  octahedra compressing upon decreased lattice parameters.



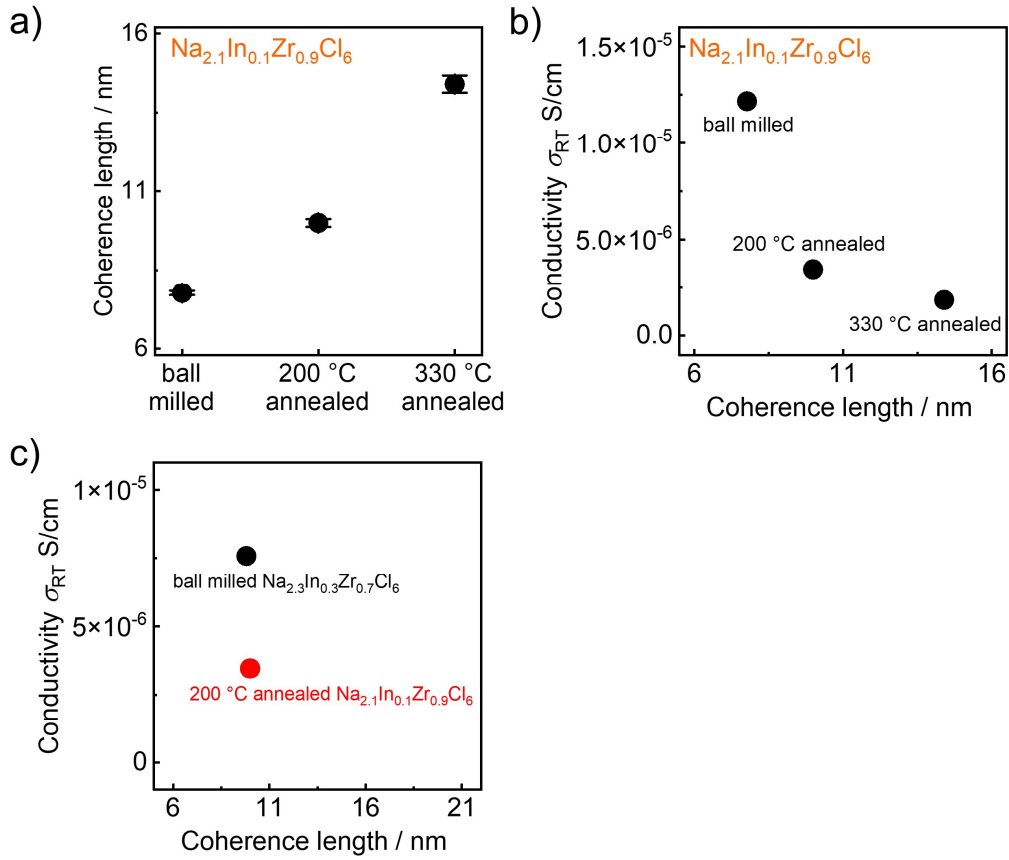
**Fig. S8.** **a)** Nyquist plots of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  ( $x = 0.1; 0.2$ ). Inset: equivalent circuit model used for fitting the measured impedance spectra. **b)** Nyquist plots of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  ( $x = 0.3; 0.4; 0.5$ ). **c)** Nyquist plots of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  ( $x = 0.6; 0.7$ ). **d)** Nyquist plots of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  ( $x = 0.8; 0.85; 0.9; 0.95$ ). These impedances were measured at room temperature (25 °C).



**Fig. S9.** Arrhenius plots from the temperature dependent impedance of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  series.



**Fig. S10.** Summary of pair distribution function fitting results of  $\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$  annealed at **a)** 200 °C and **b)** 330 °C for 1 hour.



**Fig. S11.** **a)** Coherence lengths of ball milled, 200 °C annealed and 330 °C annealed Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub>. The uncertainties, where shown, correspond to 1 $\sigma$ . **b)** Room-temperature ionic conductivities of Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub> synthesized by different procedures against coherence length. **c)** Room-temperature ionic conductivities of 200 °C annealed Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub> and ball milled Na<sub>2.3</sub>In<sub>0.3</sub>Zr<sub>0.7</sub>Cl<sub>6</sub> against coherence length. The ionic conductivities of annealed Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub> were extracted from Ref. 31.

**Table S1:** Used constraints for pair distribution function fitting of ball milled Na<sub>3-x</sub>In<sub>1-x</sub>Zr<sub>x</sub>Cl<sub>6</sub>.

Na <sub>3-x</sub> In <sub>1-x</sub> Zr <sub>x</sub> Cl <sub>6</sub>						
Lattice Parameter: $a = \gamma = 90^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{iso} / \text{\AA}^2$
		$x$	$y$	$z$		
Na1	4e	Pos1	Pos2	Pos3	$(3-x-\text{OccNa})/2$	Th1
Na2	2b	0	0	0.5	OccNa	Th1
Zr1	2a	0	0	0	$x$	Th2
In1	2a	0	0	0	$1-x$	Th2
Cl1	4e	Pos4	Pos5	Pos6	1	Th3
Cl2	4e	Pos7	Pos8	Pos9	1	Th3
Cl3	4e	Pos10	Pos11	Pos12	1	Th3

**Table S2:** Pair distribution function fitting result of ball milled Na<sub>2.9</sub>In<sub>0.9</sub>Zr<sub>0.1</sub>Cl<sub>6</sub>. Fitting range: 2 - 60  $\text{\AA}$ .

Na <sub>2.9</sub> In <sub>0.9</sub> Zr <sub>0.1</sub> Cl <sub>6</sub>				
Lattice Parameter: $a = 6.7631(5) \text{\AA}$ , $b = 7.1722(7) \text{\AA}$ , $c = 9.9708(10) \text{\AA}$ , $\beta = 90.537(13)^\circ$				
Space group: $P2_1/n$				
Atom	Wyckoff	Atomic coordinates		$U_{iso} / \text{\AA}^2$



	Position	x	y	z		
Na1	4e	0.506(2)	-0.0752(7)	0.2474(11)	0.967(11)	0.062(2)
Na2	2b	0	0	0.5	0.98(3)	0.062(2)
Zr1	2a	0	0	0	0.09(2)	0.0184(4)
In1	2a	0	0	0	0.91(2)	0.0184(4)
Cl1	4e	0.1610(8)	0.3082(6)	-0.0765(6)	1	0.0433(7)
Cl2	4e	0.1339(6)	0.0537(6)	0.2327(6)	1	0.0433(7)
Cl3	4e	-0.3071(6)	0.1724(7)	0.0536(5)	1	0.0433(7)

**Table S3:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.8}\text{In}_{0.8}\text{Zr}_{0.2}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.8}\text{In}_{0.8}\text{Zr}_{0.2}\text{Cl}_6$						
Lattice Parameter: $a = 6.7598(5)$ Å, $b = 7.1698(7)$ Å, $c = 9.9693(10)$ Å, $\beta = 90.631(13)^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		x	y	z		
Na1	4e	0.507(2)	-0.0767(7)	0.2480(11)	0.947(10)	0.067(2)
Na2	2b	0	0	0.5	0.90(3)	0.067(2)
Zr1	2a	0	0	0	0.20(2)	0.0201(4)
In1	2a	0	0	0	0.80(2)	0.0201(4)
Cl1	4e	0.1607(8)	0.3072(6)	-0.0770(6)	1	0.0457(7)
Cl2	4e	0.1324(6)	0.0517(6)	0.2324(6)	1	0.0457(7)
Cl3	4e	-0.3064(7)	0.1727(7)	0.0523(5)	1	0.0457(7)

**Table S4:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.7}\text{In}_{0.7}\text{Zr}_{0.3}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.7}\text{In}_{0.7}\text{Zr}_{0.3}\text{Cl}_6$						
Lattice Parameter: $a = 6.7563(6)$ Å, $b = 7.1656(8)$ Å, $c = 9.9670(11)$ Å, $\beta = 90.750(14)^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		x	y	z		
Na1	4e	0.507(2)	-0.0783(8)	0.2487(11)	0.960(11)	0.079(3)
Na2	2b	0	0	0.5	0.78(3)	0.079(3)
Zr1	2a	0	0	0	0.30(2)	0.0226(3)
In1	2a	0	0	0	0.70(2)	0.0226(3)
Cl1	4e	0.1612(8)	0.3092(6)	-0.0781(6)	1	0.0472(4)
Cl2	4e	0.1328(7)	0.0507(6)	0.2350(5)	1	0.0472(4)
Cl3	4e	-0.3023(3)	0.1736(4)	0.0523(4)	1	0.0472(4)

**Table S5:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.6}\text{In}_{0.6}\text{Zr}_{0.4}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.6}\text{In}_{0.6}\text{Zr}_{0.4}\text{Cl}_6$						
Lattice Parameter: $a = 6.7529(7)$ Å, $b = 7.1611(9)$ Å, $c = 9.9609(13)$ Å, $\beta = 90.88(2)^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		x	y	z		
Na1	4e	0.508(2)	-0.0774(8)	0.2437(13)	0.927(11)	0.083(3)
Na2	2b	0	0	0.5	0.73(3)	0.083(3)
Zr1	2a	0	0	0	0.42(2)	0.0254(6)
In1	2a	0	0	0	0.58(2)	0.0254(6)
Cl1	4e	0.1619(9)	0.3064(6)	-0.0797(6)	1	0.0517(8)
Cl2	4e	0.1306(7)	0.0483(7)	0.2323(6)	1	0.0517(8)
Cl3	4e	-0.3044(7)	0.1743(4)	0.0510(5)	1	0.0517(8)

**Table S6:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.5}\text{In}_{0.5}\text{Zr}_{0.5}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.5}\text{In}_{0.5}\text{Zr}_{0.5}\text{Cl}_6$						
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Lattice Parameter:  $a = 6.7463(7) \text{ \AA}$ ,  $b = 7.1544(11) \text{ \AA}$ ,  $c = 9.952(2) \text{ \AA}$ ,  $\beta = 91.05(2)^\circ$   
Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{\AA}^2$
		$x$	$y$	$z$		
Na1	4e	0.511(2)	-0.0792(8)	0.2516(13)	0.924(11)	0.091(4)
Na2	2b	0	0	0.5	0.65(3)	0.091(4)
Zr1	2a	0	0	0	0.50(2)	0.0287(6)
In1	2a	0	0	0	0.50(2)	0.0287(6)
Cl1	4e	0.1649(9)	0.3080(7)	-0.0793(7)	1	0.0572(9)
Cl2	4e	0.1287(8)	0.0464(7)	0.2319(6)	1	0.0572(9)
Cl3	4e	-0.3035(7)	0.1741(8)	0.0500(5)	1	0.0572(9)

**Table S7:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.4}\text{In}_{0.4}\text{Zr}_{0.6}\text{Cl}_6$ . Fitting range: 2 - 60  $\text{\AA}$ .

**Na<sub>2.4</sub>In<sub>0.4</sub>Zr<sub>0.6</sub>Cl<sub>6</sub>**  
Lattice Parameter:  $a = 6.7395(8) \text{ \AA}$ ,  $b = 7.1475(11) \text{ \AA}$ ,  $c = 9.937(2) \text{ \AA}$ ,  $\beta = 91.24(2)^\circ$   
Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{\AA}^2$
		$x$	$y$	$z$		
Na1	4e	0.515(2)	-0.0797(9)	0.2439(12)	0.932(11)	0.092(4)
Na2	2b	0	0	0.5	0.52(3)	0.092(4)
Zr1	2a	0	0	0	0.62(2)	0.0287(6)
In1	2a	0	0	0	0.38(2)	0.0287(6)
Cl1	4e	0.1648(8)	0.3043(6)	-0.0799(6)	1	0.0573(9)
Cl2	4e	0.1279(8)	0.0459(7)	0.2329(6)	1	0.0573(9)
Cl3	4e	-0.3018(7)	0.1765(8)	0.0514(5)	1	0.0573(9)

**Table S8:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.3}\text{In}_{0.3}\text{Zr}_{0.7}\text{Cl}_6$ . Fitting range: 2 - 60  $\text{\AA}$ .

**Na<sub>2.3</sub>In<sub>0.3</sub>Zr<sub>0.7</sub>Cl<sub>6</sub>**  
Lattice Parameter:  $a = 6.7308(9) \text{ \AA}$ ,  $b = 7.1387(11) \text{ \AA}$ ,  $c = 9.918(2) \text{ \AA}$ ,  $\beta = 91.51(2)^\circ$   
Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{\AA}^2$
		$x$	$y$	$z$		
Na1	4e	0.517(2)	-0.0813(9)	0.2461(12)	0.932(11)	0.094(4)
Na2	2b	0	0	0.5	0.44(3)	0.094(4)
Zr1	2a	0	0	0	0.70(2)	0.02862(13)
In1	2a	0	0	0	0.30(2)	0.02862(13)
Cl1	4e	0.1671(9)	0.3023(7)	-0.0784(6)	1	0.05863(14)
Cl2	4e	0.1286(9)	0.0461(7)	0.2357(4)	1	0.05863(14)
Cl3	4e	-0.2996(3)	0.1742(4)	0.0517(4)	1	0.05863(14)

**Table S9:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.2}\text{In}_{0.2}\text{Zr}_{0.8}\text{Cl}_6$ . Fitting range: 2 - 60  $\text{\AA}$ .

**Na<sub>2.2</sub>In<sub>0.2</sub>Zr<sub>0.8</sub>Cl<sub>6</sub>**  
Lattice Parameter:  $a = 6.7182(10) \text{ \AA}$ ,  $b = 7.1300(12) \text{ \AA}$ ,  $c = 9.894(2) \text{ \AA}$ ,  $\beta = 91.781(15)^\circ$   
Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{\AA}^2$
		$x$	$y$	$z$		
Na1	4e	0.520(2)	-0.0863(9)	0.2487(12)	0.978(13)	0.099(4)
Na2	2b	0	0	0.5	0.24(3)	0.099(4)
Zr1	2a	0	0	0	0.80(2)	0.0282(3)
In1	2a	0	0	0	0.20(2)	0.0282(3)
Cl1	4e	0.1733(9)	0.3012(7)	-0.0759(7)	1	0.0587(3)
Cl2	4e	0.1319(10)	0.0440(7)	0.2367(5)	1	0.0587(3)
Cl3	4e	-0.2985(1)	0.1749(3)	0.0522(4)	1	0.0587(3)

**Table S10:** Pair distribution function fitting result of ball milled  $\text{Na}_{2.15}\text{In}_{0.15}\text{Zr}_{0.85}\text{Cl}_6$ . Fitting

range: 2 - 60 Å.

**Na<sub>2.15</sub>In<sub>0.15</sub>Zr<sub>0.85</sub>Cl<sub>6</sub>**

Lattice Parameter:  $a = 6.710(2)$  Å,  $b = 7.121(2)$  Å,  $c = 9.883(3)$  Å,  $\beta = 91.91(2)^\circ$

Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.513(3)	-0.0814(13)	0.247(2)	0.95(2)	0.100(6)
Na2	2b	0	0	0.5	0.25(2)	0.100(6)
Zr1	2a	0	0	0	0.85(3)	0.0288(7)
In1	2a	0	0	0	0.15(3)	0.0288(7)
Cl1	4e	0.1576(12)	0.2993(10)	-0.0797(10)	1	0.0599(9)
Cl2	4e	0.1306(10)	0.0446(10)	0.2290(3)	1	0.0599(9)
Cl3	4e	-0.3061(9)	0.1918(12)	0.0497(8)	1	0.0599(9)

**Table S11:** Pair distribution function fitting result of ball milled Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub>. Fitting range: 2 - 60 Å.

**Na<sub>2.1</sub>In<sub>0.1</sub>Zr<sub>0.9</sub>Cl<sub>6</sub>**

Lattice Parameter:  $a = 6.7067(14)$  Å,  $b = 7.116(2)$  Å,  $c = 9.873(2)$  Å,  $\beta = 92.05(2)^\circ$

Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.498(2)	-0.0690(13)	0.2142(13)	0.96(2)	0.100(5)
Na2	2b	0	0	0.5	0.18(4)	0.100(5)
Zr1	2a	0	0	0	0.90(3)	0.0300(10)
In1	2a	0	0	0	0.10(3)	0.0300(10)
Cl1	4e	0.1664(10)	0.2967(8)	-0.0761(8)	1	0.0636(11)
Cl2	4e	0.1290(9)	0.0474(9)	0.2315(4)	1	0.0636(11)
Cl3	4e	-0.3030(8)	0.1834(11)	0.0539(6)	1	0.0636(11)

**Table S12:** Pair distribution function fitting result of ball milled Na<sub>2.5</sub>In<sub>0.5</sub>Zr<sub>0.5</sub>Cl<sub>6</sub>. Fitting range: 2 - 20 Å.

**Na<sub>2.5</sub>In<sub>0.5</sub>Zr<sub>0.5</sub>Cl<sub>6</sub>**

Lattice Parameter:  $a = 6.746(3)$  Å,  $b = 7.150(3)$  Å,  $c = 9.952(6)$  Å,  $\beta = 91.17(7)^\circ$

Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.515(2)	-0.0817(10)	0.259(2)	1.00(2)	0.075(5)
Na2	2b	0	0	0.5	0.48(5)	0.075(5)
Zr1	2a	0	0	0	0.52(3)	0.027(2)
In1	2a	0	0	0	0.48(3)	0.027(2)
Cl1	4e	0.1642(14)	0.3157(12)	-0.0845(11)	1	0.055(2)
Cl2	4e	0.126(2)	0.0429(13)	0.2333(7)	1	0.055(2)
Cl3	4e	-0.3019(4)	0.177(2)	0.052(2)	1	0.055(2)

**Table S13:** Pair distribution function fitting result of ball milled Na<sub>2.5</sub>In<sub>0.5</sub>Zr<sub>0.5</sub>Cl<sub>6</sub>. Fitting range: 2 - 40 Å.

**Na<sub>2.5</sub>In<sub>0.5</sub>Zr<sub>0.5</sub>Cl<sub>6</sub>**

Lattice Parameter:  $a = 6.7472(11)$  Å,  $b = 7.156(2)$  Å,  $c = 9.952(2)$  Å,  $\beta = 91.18(2)^\circ$

Space group:  $P2_1/n$

Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.514(2)	-0.0840(9)	0.2584(12)	0.946(13)	0.074(4)
Na2	2b	0	0	0.5	0.58(4)	0.074(4)
Zr1	2a	0	0	0	0.52(3)	0.0262(6)
In1	2a	0	0	0	0.48(3)	0.0262(6)
Cl1	4e	0.1678(10)	0.3107(8)	-0.0838(8)	1	0.0543(9)
Cl2	4e	0.1287(9)	0.0417(8)	0.2321(6)	1	0.0543(9)
Cl3	4e	-0.3039(6)	0.1745(9)	0.0500(6)	1	0.0543(9)

**Table S14.** Fitted parameters of room-temperature impedance spectra of ball milled  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$ , where  $x$  represents nominal Zr content;  $R_{\text{bulk/GB}}$  and  $\text{CPE}_{\text{bulk/GB}}$  represent the resistance and CPE capacitance of  $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$  pellets respectively;  $\alpha_{\text{bulk/GB}}$  is the ideal indicator of  $\text{CPE}_{\text{bulk/GB}}$ ;  $\text{CPE}_{\text{BE}}$  represent the CPE capacitance of blocking electrode;  $\alpha_{\text{BE}}$  is the ideal indicator of  $\text{CPE}_{\text{BE}}$ .

$x$ in $\text{Na}_{3-x}\text{In}_{1-x}\text{Zr}_x\text{Cl}_6$	$R_{\text{bulk/GB}}$	$\text{CPE}_{\text{bulk/GB}}$	$\alpha_{\text{bulk/GB}}$	$\text{CPE}_{\text{BE}}$	$\alpha_{\text{BE}}$
0.1	$6.37 \times 10^5$	$7.56 \times 10^{-11}$	0.98	$7.37 \times 10^{-7}$	0.73
0.2	$1.46 \times 10^5$	$4.33 \times 10^{-11}$	0.97	$4.43 \times 10^{-7}$	0.74
0.3	$1.48 \times 10^5$	$3.75 \times 10^{-11}$	0.97	$5.90 \times 10^{-6}$	0.78
0.4	$5.56 \times 10^4$	$5.00 \times 10^{-11}$	0.98	$2.07 \times 10^{-6}$	0.84
0.5	$2.81 \times 10^4$	$8.04 \times 10^{-11}$	0.94	$2.42 \times 10^{-6}$	0.61
0.6	$4.32 \times 10^4$	$5.79 \times 10^{-11}$	0.97	$2.59 \times 10^{-6}$	0.66
0.7	$3.97 \times 10^4$	$4.06 \times 10^{-11}$	0.96	$2.52 \times 10^{-6}$	0.84
0.8	$3.18 \times 10^4$	$2.17 \times 10^{-10}$	0.88	$1.38 \times 10^{-6}$	0.75
0.85	$1.61 \times 10^4$	$1.11 \times 10^{-10}$	0.97	$5.51 \times 10^{-6}$	0.82
0.9	$2.27 \times 10^4$	$9.56 \times 10^{-11}$	0.91	$2.10 \times 10^{-6}$	0.79
0.95	$1.25 \times 10^4$	$8.88 \times 10^{-11}$	0.93	$4.73 \times 10^{-6}$	0.73

**Table S15:** Pair distribution function fitting result of 200 °C annealed  $\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$						
Lattice Parameter: $a = 6.7117(11)$ Å, $b = 7.1204(12)$ Å, $c = 9.880(2)$ Å, $\beta = 91.907(14)^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.505(2)	-0.0757(12)	0.2256(15)	0.949(15)	0.100(5)
Na2	2b	0	0	0.5	0.19(4)	0.100(5)
Zr1	2a	0	0	0	0.91(3)	0.0216(8)
In1	2a	0	0	0	0.09(3)	0.0216(8)
Cl1	4e	0.1693(10)	0.2984(8)	-0.0782(8)	1	0.0216(8)
Cl2	4e	0.1285(9)	0.0470(9)	0.2315(4)	1	0.0566(10)
Cl3	4e	-0.3044(8)	0.1858(10)	0.0525(6)	1	0.0566(10)

**Table S16:** Pair distribution function fitting result of 330 °C annealed  $\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$ . Fitting range: 2 - 60 Å.

$\text{Na}_{2.1}\text{In}_{0.1}\text{Zr}_{0.9}\text{Cl}_6$						
Lattice Parameter: $a = 6.7058(9)$ Å, $b = 7.1113(9)$ Å, $c = 9.8744(12)$ Å, $\beta = 91.908(10)^\circ$						
Space group: $P2_1/n$						
Atom	Wyckoff Position	Atomic coordinates			Occ.	$U_{\text{iso}} / \text{Å}^2$
		$x$	$y$	$z$		
Na1	4e	0.511(2)	-0.0853(10)	0.2451(13)	0.955(14)	0.090(4)
Na2	2b	0	0	0.5	0.20(4)	0.090(4)
Zr1	2a	0	0	0	0.89(3)	0.0205(7)
In1	2a	0	0	0	0.11(3)	0.0205(7)
Cl1	4e	0.1692(8)	0.2990(6)	-0.0722(6)	1	0.0452(8)
Cl2	4e	0.1266(8)	0.0424(7)	0.2289(3)	1	0.0452(8)
Cl3	4e	-0.3098(7)	0.1821(8)	0.0532(5)	1	0.0452(8)

The uncertainties shown in the tables correspond to  $1\sigma$ .