Evaluation items for all solid state battery
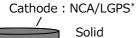
Item	Method	Information
Morphology / elemental distribution	SEM-EDX (surface/cross-section)	Morphology, dispersiveness of active material and solid electrolyte
Composition	RBS/HFS/NRA/PIXE	Compositional depth profile (~30 μm)
Interface characterization	Cross-sectional STEM (EELS, EDX)	Detailed elemental distribution at active material / solid electrolyte interface
Ionic conductivity	PFG-NMR, Solid state NMR	Diffusion coefficient, mobility of Li$^+$
Electronic conductivity	SSRM, TUNA	Mapping of conduction path
Mechanical characteristic	Indentation	Modulus, hardness
Chemical structure	Raman spectroscopy, Solid state NMR	Chemical unit structure
Gas generation	TPD-MS	Gas quantification during annealing
Crystalline structure	XRD	Change of crystalline structure during annealing

Dispersiveness evaluation by EDX mapping
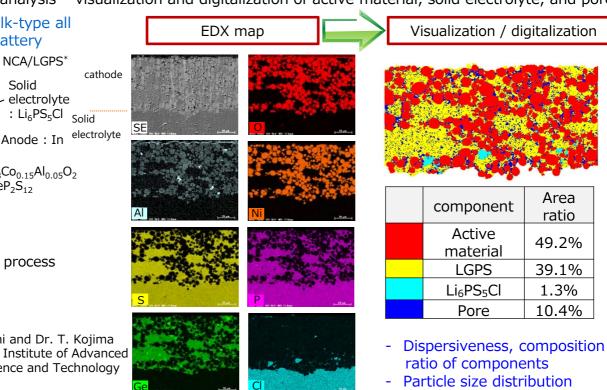
- Low damage observation with high detection efficiency EDX
- Image analysis – visualization and digitalization of active material, solid electrolyte, and pore

Sample : bulk-type all solid state battery

Cathode : NCA/LGPS*

Solid electrolyte : Li$_6$PS$_5$Cl

Anode : In

cathode

Solid electrolyte

* NCA: LiNi$_{0.8}$Co$_{0.15}$Al$_{0.05}$O$_2$
  LGPS:Li$_{10}$GeP$_2$S$_{12}$

- 10 mmφ
- Pressing
- Under inert process

Sample:
Dr. M. Tabuchi and Dr. T. Kojima from National Institute of Advanced Industrial Science and Technology (AIST)

EDX map

Visualization / digitalization

	component	Area ratio
(red)	Active material	49.2%
(yellow)	LGPS	39.1%
(cyan)	Li$_6$PS$_5$Cl	1.3%
(blue)	Pore	10.4%

- Dispersiveness, composition ratio of components
- Particle size distribution

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