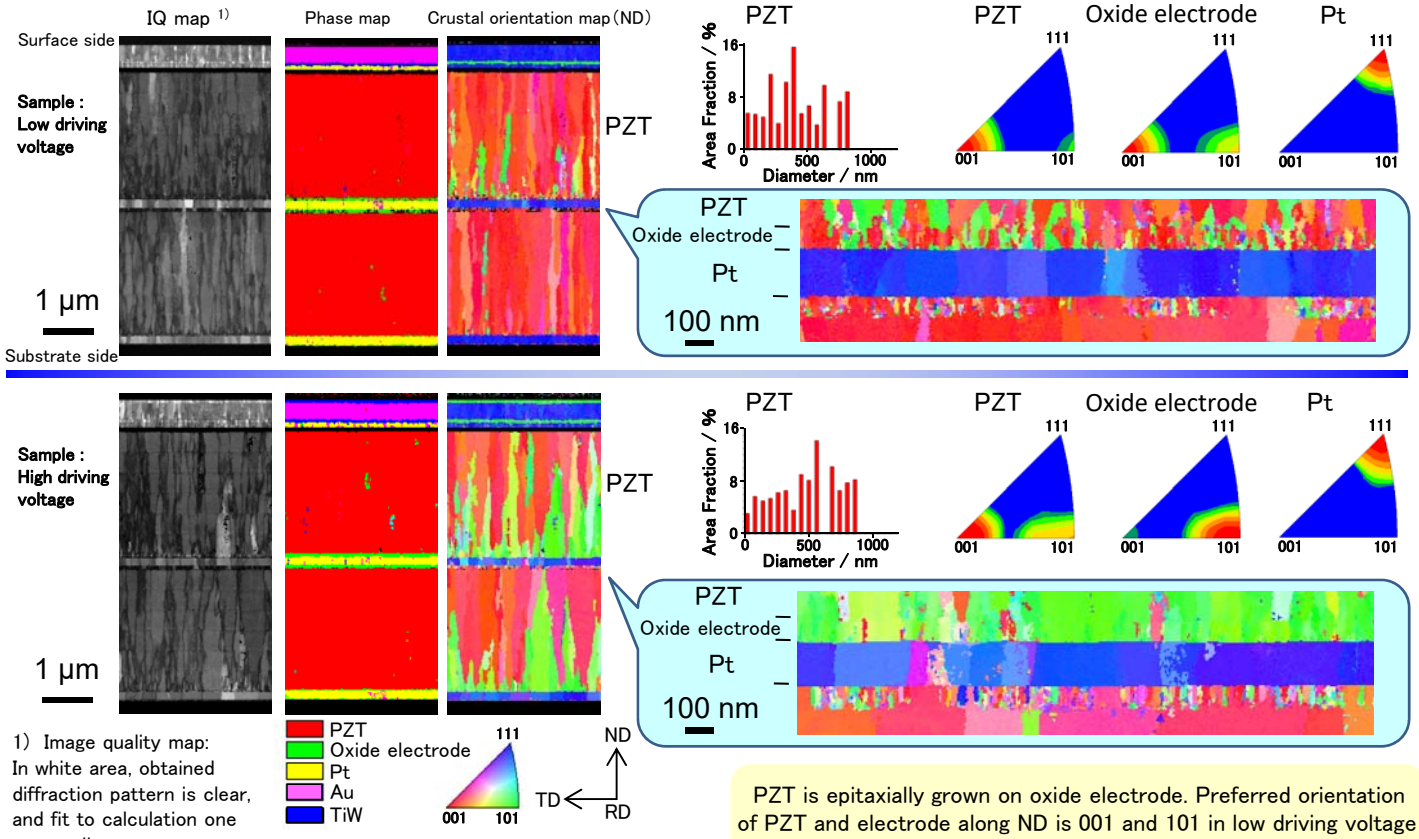
Characterization of grain diameter and crystal orientation in the MEMS devise using ASTAR

It is important to control and estimate crystal grain size and orientation in device design.
In PZT device (MEMS mirror), the relationship between device property and structure was researched.

PZT: Lead zirconate titanate

ASTAR analysis in cross-section of PZT device



1) Image quality map:
In white area, obtained diffraction pattern is clear, and fit to calculation one very well.

PZT is epitaxially grown on oxide electrode. Preferred orientation of PZT and electrode along ND is 001 and 101 in low driving voltage sample, 101 in high driving voltage sample respectively.

Quantitative value of orientation and grain size

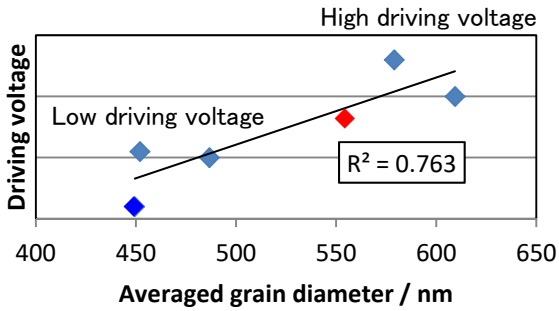
Table: Intensity of inverse pole figure / times random

	Preferred orientation	Sample: Low driving voltage	Sample: High driving voltage
PZT	ND // 001	21.8	7.1
	ND // 101	1.3	2.8
Oxide electrode	ND // 001	19.3	1.0
	ND // 101	3.2	9.7
Pt	ND // 111	34.2	18.2

Table: Averaged grain diameter / nm

	Low driving voltage	High driving voltage
PZT	450.0	553.3

The relationship between driving voltage and grain size of PZT



It is suggested that driving voltage is correlated with grain size.
Quantitative value obtained by ASTAR analysis is useful for device design.