**KNN lead-free technology on 200 mm Si wafer for piezoelectric actuator applications**

**Supplementary material**

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Fig. S1 shows an SEM cross-section image of a 1.9 µm thick KNN layer, which appears dense without apparent porosity, with columnar grains. X-ray diffraction (XRD) theta-2 theta (λ = 1.54 Å) and Energy Dispersive X-ray Spectrometry (EDX) measurements were also performed to verify the crystalline structure and the composition of the film. A pure perovskite phase is identified with a preferential orientation (001) as shown on Fig. S2. The composition was determined as (K0.34Na0.66)1.0NbO3. These results are in good agreement with those reported by Shibata *et al* [1].



**Fig. S1:** SEM cross-sectional image of a 1.9 µm thick KNN film deposited on 200 mm in diameter platinized SOI (Silicon On Insulator) wafer.



**Fig. S2:** XRD diffractogram measured on a 1.9 µm thick KNN film deposited on 200 mm in diameter platinized SOI wafer.

Fig. S3 illustrates the main steps of the KNN based MEMS fabrication by taking the example of a ring shaped actuator.



**Fig. S3:** Schematic view of the KNN based MEMS fabrication process.

 [1] K. Shibata, K. Watanabe, T. Kuroda, T. Osada, "KNN lead-free piezoelectric films grown by sputtering" Appl. Phys. Lett. 121, 092901 (2022).