

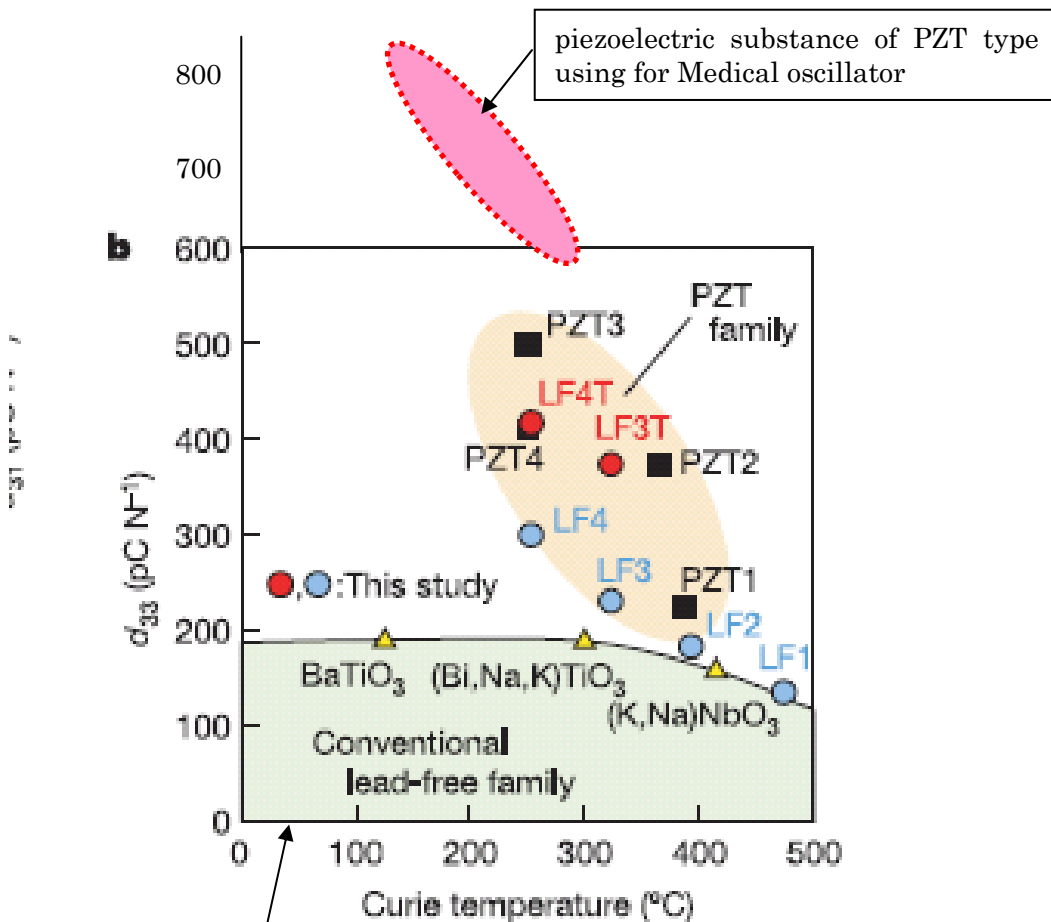
## Lead free piezoelectric substance for Medical Ultrasound probe

- Generally the lead free piezoelectric substance has less performance than PZT in piezoelectric constant  $d_{33}$
- The current very advanced lead free piezoelectric substance seems not to be worse performance than the common PZT, however is not in commercial field still.
- PZT for medical use shall be requested to have higher performance than the common PZT, and the current very advanced lead free piezoelectric substance can not achieve the requested performance.

(Details)

It is important for piezoelectric substance in the Medical ultrasound probe to have high performance in piezoelectric constant  $d_{33}$ .

Generally  $d_{33}$  is correlated to the Curie temperature  $T_c$  at which piezoelectric effect disappears.  $T_c$  for piezoelectric substance of PZT type using for Medical oscillator is 150–300°C, and  $d_{33}$  is 550 – 800 pC/N. It is clear from Fig.1, there is no lead free piezoelectric substance which has the requested performance. In case of using low value of  $d_{33}$ , the equipment performance shall be impaired dramatically because of insufficient sensitivity of transmitting and receiving.



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