

APPENDIX 1 **VALUES FOR THE MATERIAL CONSTANTS USED IN THIS INVESTIGATION**

In order to determine the values for $Tc_{\lambda\mu}^{(n)}$, $Ts_{\lambda\mu}^{(n)}$ ($n = 1, 2, 3$), the following values for the material constants of alpha-quartz have been used in the course of this investigation:

1) Elastic stiffnesses $c_{\lambda\mu}$ of alpha-quartz are given in Table 4; elastic compliances $s_{\lambda\mu}$ of alpha-quartz, in Table 10.

$$\begin{aligned} 2) \quad e_{11} &= 0.171 \\ e_{14} &= 0.0403 \end{aligned}$$

Piezoelectric stress constants in Cm^{-2} of alpha-quartz. [9].

$$\begin{aligned} 3) \quad \epsilon_{11}^T &= \epsilon_{22}^T = 39.97 & \epsilon_{11}^S - \epsilon_{11}^T &= -0.76 \\ \epsilon_{33}^T &= 41.03 & \epsilon_{33}^S - \epsilon_{33}^T &= 0 \end{aligned}$$

Dielectric constants in $10^{-12} \text{ F m}^{-1}$ of alpha-quartz.

$$\begin{aligned} 4) \quad \alpha_{11}^{(1)} &= \alpha_{22}^{(1)} = 13.71 \cdot 10^{-6} / ^\circ\text{C} \\ \alpha_{33}^{(1)} &= 7.48 \\ \alpha_{11}^{(2)} &= \alpha_{22}^{(2)} = 6.5 \cdot 10^{-9} / (^\circ\text{C})^2 \\ \alpha_{33}^{(2)} &= 2.9 \\ \alpha_{11}^{(3)} &= \alpha_{22}^{(3)} = -1.9 \cdot 10^{-12} / (^\circ\text{C})^3 \\ \alpha_{33}^{(3)} &= -1.5 \end{aligned}$$

Coefficients of thermal expansion of alpha-quartz.

$$\begin{aligned} 5) \quad \rho &= 2.650 \cdot 10^3 \text{ Nm}^{-4} \text{ s}^2 \\ T_\rho^{(1)} &= -34.92 \cdot 10^{-6} / (^\circ\text{C}) \\ T_\rho^{(2)} &= -15.9 \cdot 10^{-9} / (^\circ\text{C})^2 \\ T_\rho^{(3)} &= 5.30 \cdot 10^{-12} / (^\circ\text{C})^3 \end{aligned}$$

Density and its temperature coefficients of alpha-quartz.