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Estimates of elastic moduli and internal friction of Periclase(MgO) by Sompi analysis for resonant sphere spectroscopy

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We applied the resonant sphere technique (RST) to measurements of elastic moduli and internal friction of small specimens of periclase(MgO). In RST, free oscillations of the sample are excited by impulsive input, and the output waveform data are acquired (FT method). The resonant spectra are obtained by spectral analysis. The elastic moduli C_{ij}'s are determined by inverting peak frequencies, and the internal friction $Q^{-1}{}_{ij}$'s are determined by using the half-width of the peaks. The Fast Fourier Transform(FFT) method has been used in the spectral analysis in RST, but the frequency resolution of the spectrum obtained by FFT is not sufficient, especially for the half-width measurements. In contrast, we used eigenfrequencies and eigendecayrates by Sompi analysis for inversion, which may yield better results. In this study both (1) FFT and (2) Sompi methods were applied in the analysis of RST data, and the results were compared. Although the results show that eigenfrequencies obtained by FFT and Sompi analyses are almost consistent, the internal friction analyses using the two techniques show different values. The internal friction obtained by Sompi analysis exhibits reasonable results ranging from $0.11\text{x}10^{-4}$ to $1.75\text{x}10^{-4}$, whereas those by FFT technique range from $-1.05\text{x}10^{-4}$ to $1.06\text{x}10^{-4}$ and show the negative minima for $Q^{-1}{}_{12}$ and $Q^{-1}{}_{k}$. The present study suggests that the Sompi analysis technique may be applicable even to anisotropic elasticity and internal friction.