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COHERENCE RELAXATION OF PHONONS IN K_2CO_3 AND $NaCO_3$ CRYSTALS

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The coherence decay times of some internal phonons of K_2CO_3 and $NaCO_3$ oriented single crystals have been measured from 10 K to room temperature, by means of a time-domain RRS Spectrometer. In K_2CO_3 , the 30^- symmetric stretching mode at 293 cm^{-1} shows a very slow relaxation at low temperature: its decay time is measured to be $7.7 \pm 0.94 \text{ ps}$ at 10 K, and shortens to $T_c = 10 \text{ ps}$ at 100 K. All the other phonons show much faster decays, near or below the time resolution of the experimental apparatus ($\sim 5 \text{ ps}$).

A similar behaviour is shown by $NaCO_3$, the 10^- symmetric stretching phonon at 1086 cm^{-1} being the only vibration whose decay time can be measured: T_c ranges between 5 ps at room temperature to 17 ps at 10 K. The different behaviour of the various Raman modes is interpreted in terms of population relaxation mechanisms, and related to the multi-phonon density of states involved in three and multi-phonon scattering processes.