**Polarized Raman scattering study of kesterite type Cu2ZnSnS4 single crystals**

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**Abstract.** A non-destructive Raman spectroscopy has been widely used as a complimentary method to X-ray diffraction characterization of Cu2ZnSnS4 (CZTS) thin films, yet our knowledge of the Raman active fundamental modes in this material is far from complete. Focusing on polarized Raman spectroscopy provides important information about the relationship between Raman modes and CZTS crystal structure. In this framework the zone–center optical phonons of CZTS, which is most usually examined in active layers of the CZTS based solar cells, are studied by polarized resonant and non-resonant Raman spectroscopy in the range from 60 to 500 cm−1 on an oriented single crystal. The phonon mode symmetry of 20 modes from the 27 possible vibrational modes of the kesterite structure is experimentally determined. From in-plane angular dependences of the phonon modes intensities Raman tensor elements are also derived. Whereas a strong intensity enhancement of the polar E and B symmetry modes is induced under resonance conditions, no mode intensity dependence on the incident and scattered light polarization configurations was found in these conditions. Finally, Lyddane-Sachs-Teller relations are applied to estimate the ratios of the static to high-frequency optic dielectric constants parallel and perpendicular to c-optical axis.

**Keywords:** Cu2ZnSnS4, Raman spectroscopy, crystal structure, phonon mode.

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