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OH signature of pyroxenes: A new probe for studying lithospheric processes?

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Depending of their metasomatic history or geodynamic origin OH stretching bands of lithospheric pyroxenes in the frequency range 3000 – 3700 cm^{-1} show different signatures. Pyroxenes from continental lithosphere having undergone “wet” metasomatism have distinct signature compared to continental pyroxenes having undergone “dry” metasomatism. Pyroxenes from oceanic lithosphere have a third type of signature. We present recent analyses of xenoliths and a review of the literature showing that the phenomenon is widely distributed among continents and oceans. It shows that the phenomenon affects simultaneously opx and cpx and pyroxenes from various lithologies: peridotites, pyroxenites and granulites. For instance, in continental lithosphere, OH bands at 3600 and 3415 cm^{-1} for opx and 3635 and 3445 cm^{-1} for cpx dominate pyroxenes affected by “wet” metasomatism; while OH bands at 3570 and 3515 cm^{-1} for opx and 3595 and 3515 cm^{-1} for cpx dominate pyroxenes affected by “dry” metasomatism. Opxs from oceanic lithosphere have OH spectra dominated by the band at 3415 cm^{-1} with a smaller contribution of the bands at 3520 and 3570 cm^{-1}.

In all these observations it was not possible to correlate the signatures with a specific major, minor or trace element and the exact nature of the signatures remains to be identified. Nevertheless, these OH signatures are representative of specific lithospheric events and offer a potential new benchmark for the study of lithospheric processes.