Raman spectroscopy of the ilmenite–geikielite solid solution

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ABSTRACT

Ilmenite ($Fe^{2+}TiO_3$) and geikielite ($MgTiO_3$) are important terrestrial minerals relevant to the geology of the Earth, the Moon, Mars, and meteorite samples. Raman spectroscopy is a powerful technique that allows for mineral cation determination for the ilmenite–geikielite solid solution. We report on a suite of nine samples within the ilmenite–geikielite solid solution and provide context for their quantitative interpretation. We compare a univariate Raman peak position model for predicting ilmenite composition with a multivariate machine learning model. The univariate model is currently recommended, though the multivariate model may become superior if the data set size is increased. This study lays the groundwork for quantifying Fe (ilmenite) and Mg (geikielite) within oxide minerals using a cheap, portable, and efficient technology like Raman spectroscopy.

Keywords: Ilmenite, geikielite, Raman spectroscopy