HIGH TEMPERATURE DECOMPOSITION OF ALMANDINE AND PYROPE IN REDUCING ATMOSPHERE

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Thermal decomposition of two garnets of near end-member composition – almandine $(Fe_{2.85}Mg_{0.15})(Al_{1.99})Si_{2.99}O_{12}$ and pyrope $(Mg_{2.22}Fe_{0.47}Ca_{0.33})(Cr_{0.11}Fe_{0.06}Al_{1.81})Si_{2.98}O_{12}$ – has been carried out in reducing atmosphere (forming gas: 10% of H_2 in N_2). High-temperature behavior of both samples was monitored using of simultaneous thermogravimetry and differential scanning calorimetry (heating rate of 10 °C/min). The decomposition of almandine and pyrope turned out to proceed at slightly different temperatures above 1000 °C. Subsequently, two series of samples were prepared based on results of thermal analysis: almandine (ALM) heated up to 950 °C, 1070 °C and 1200 °C, and pyrope (PY) heated up to 1000 °C, 1100 °C, 1125 °C and 1200 °C. The identification of the decomposition products was performed by using of X-ray powder diffraction and Mössbauer spectroscopy (Figure 1). The common decomposition products are metallic iron and spinel phase, while the other products include fayalite, cristobalite and cordierite for almandine; and pyroxene and anorthite for pyrope. The formation of this last component was enabled due to Ca content in pyrope.

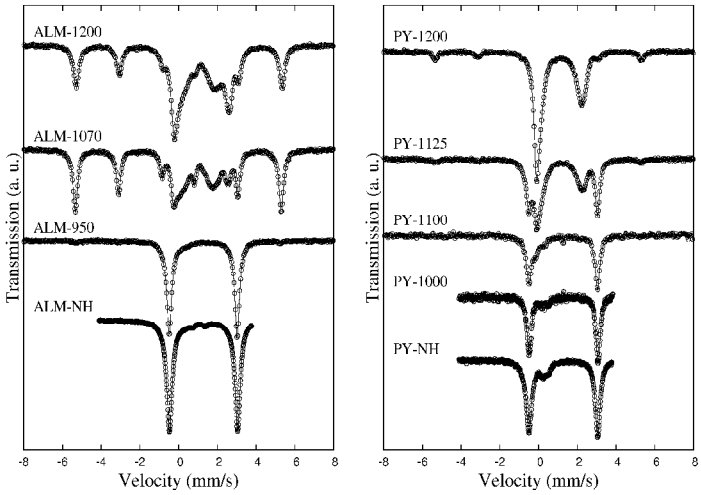

Figure 1: Mössbauer spectra demonstrating the thermal decomposition of almandine (left) and pyrope (right) under reducing atmosphere.

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