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Petrology and mineralogy of wollastonite- and melilite-bearing paralavas from the Central Apennines, Italy

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ABSTRACT

Small outcrops of wollastonite- and melilite-bearing pyrometamorphic rocks (paralavas) are found along the Apennine chain in Central Italy at the localities of Colle Fabbri and Ricetto. These rocks have coarse- to fine-grained crystalline, spotted, and glassy textures. The Colle Fabbri rocks have abundant and ubiquitous wollastonite, with plagioclase ± clinopyroxene. Melilite is found only in the most Ca-rich and silica-poor samples. Garnet, perovskite, quartz, leucite, silica-rich glassy mesostasis, and ocelli filled by calcite are present locally. The Ricetto rock is made up of wollastonite and melilite with minor clinopyroxene set in a glassy matrix with a few crystals of restitic quartz. These rocks have variable contents of SiO_2 (43 to 64 wt%) and CaO (37 to 3.7 wt%). The latter decreases with increasing MgO, Al_2O_3, $Fe_2O_{3\ tot}$, TiO_2, K_2O, SiO_2, and most trace elements, excluding Sr. Peculiar parageneses (e.g., coexisting melilite and anorthite in the most silica-poor samples, abundance of wollastonite), mineral compositions (gehlenite-rich melilite; Al-, Ti-, and Fe^{3+}-rich clinopyroxene; Al-, Ti-rich, but Fe-poor garnet), and major- and trace-element geochemistry suggest that the Colle Fabbri and Ricetto rocks are not ultimately mantle-derived, but are the result of melting, devolatilization, and recrystallization of marly sediments (50–60 to 5–10% calcite, with clay minerals ± quartz), likely due to coal fires. The $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ range from 0.70772 to 0.71190 and from 0.51223 to 0.51219, respectively, again suggesting sedimentary protoliths of a mixed nature. Substantial chemical and isotopic differences between these samples and those from the Roman Magmatic Province are highlighted.