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Sm-Nd and U-Pb Garnet Growth Ages in Peraluminous Granites in New England, USA

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The Cardigan Pluton in South Central New Hampshire (and its apparent extension as the narrow Coys Hill Granite into Central Massachusetts) is a peraluminous granitic pluton within the Kinsman Granodiorite of the New Hampshire Plutonic Suite (NHPS). The NHPS intrudes the metasedimentary Central Maine Terrane. The Cardigan Pluton and Coys Hill Granite are notable for their abundant garnet crystals, up to 1–3 cm in size. The Kinsman Granodiorite is synkinematic with the Acadian orogeny; published zircon U-Pb dates from the pluton and Coys Hill span 406 to 392 Ma [1,2]. To evaluate whether the garnet records the same time as igneous emplacement, we present Sm-Nd TIMS and *in situ* LA-MC-ICPMS U-Pb geochronology of garnet from these peraluminous igneous rocks. One sample taken from the Cardigan Pluton yields a bulk garnet Sm-Nd age of ca. 399–395 Ma, in good agreement with the zircon ages. A sample taken from the Coys Hill Granite 113 km further south yields a bulk garnet age of ca. 340 Ma. *In situ* U-Pb garnet geochronology of both samples in the Cardigan Pluton and the related Coys Hill Granite yield results in broad agreement with the Sm-Nd garnet ages. LA-ICPMS maps of representative garnets from both samples show well-preserved zonation in REEs (in particular Yb and Lu), indicating that the Sm-Nd isotopic system has not been disturbed (and hence, neither the U-Pb system). Thus, our Sm-Nd and U-Pb ages are indeed primary growth ages and have not been altered by subsequent diffusion. The ca. 60 Myr difference in garnet crystallization between the Cardigan Pluton and the Coys Hill Granite suggests that they represent melt crystallization in different orogenic settings.

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[2] Moecher, D.P., McCulla, J.K., Massey, M.,A. (2021). Zircon and monazite geochronology in the Palmer zone of transpression, south-central New England, USA: Constraints on timing of deformation, high-grade metamorphism, and lithospheric foundering during late Paleozoic oblique collision in the Northern Appalachian orogen. *GSA Bulletin* 133 (5-6), 1021-1038.