Metasedimentary rocks with ca. 3.0 Ga depositional ages exposed at Mt. Narryer, Western Australia contain Hadean (>4.0 Ga) detrital zircons. Previous studies have demonstrated that detrital zircons from the metasedimentary rocks define two distinctive age groups, an older group from 4.28-4.00 Ga and a younger group from 3.75-3.25 Ga. We have studied the age of monazites from the metasedimentary rocks relative to zircon U-Pb ages to constrain their provenance as well as post-depositional thermal history. About 450 monazite grains were separated from five rock samples and their U-Th-Pb isotopes were measured by LA-ICPMS.

All monazite populations show a prominent peak at 2.70-2.65 Ga in the \(^{207}\text{Pb}^{/^{206}\text{Pb}}\) age histograms, indicating monazite recrystallization and/or growth during the metamorphism at that time. This is consistent with hornblende K-Ar ages and zircon overgrowth U-Pb ages from the sequence. While the 2.70-2.65 Ga grains are dominant in the monazite populations from four rock samples, one sample yielded a significant number >3.0 Ga monazite grains (ca. 50%). The older pre-depositional monazite population shows a small peak at 3.6 Ga and more dominant peaks at 3.30-3.25 Ga. In addition, some grains with ages of 3.6 and 3.3 Ga have oscillatory zoning structures. These observations clearly indicate that the sedimentary rocks partly derived from 3.6 and 3.3 Ga granitic rocks. Interestingly, no Hadean monazites have been found here: the oldest monazites identified have a maximum age of ca. 3.6 Ga. The lack of Hadean monazite can be interpreted as indicating that the source rocks experienced a sequence of metamorphic events from ca. 3.6 Ga, or alternatively, the source rocks might be mafic-intermediate in composition, rather than felsic, and hence did not contain igneous monazite.

Keywords: Monazite; Zircon; Hadean; Archean; LA-ICPMS

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