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# In-Situ SHRIMP U-Pb Dating of Xenotime Outgrowth on Detrital Zircon Grains from the Changzhougou Formation of the Ming Tomb District, Beijing

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SHRIMP U-Pb dating of diagenetic xenotime from sedimentary rocks has provided age constraints for sedimentary diagenesis (McNaughton et al., 1999; Fletcher et al., 2000; England et al., 2001; Rasmussen et al., 2004; Vallini et al., 2007). Xenotime (YPO4) may grow during early diagenesis, typically being present as a trace constituent in siliciclastic sedimentary rocks (Rasmussen, 2005), in the form of syntaxial outgrowths on detrital zircon grains. Diagenetic xenotime occurs in a wide variety of rock types, including conglomerate, sandstone, siltstone, shale, phosphorite and volcaniclastic rocks, which vary in age from the early Archaean to the Mesozoic (Rasmussen, 2005).

Xenotime can be an isotopically robust U–Pb chronometer (McNaughton et al., 1999; Fletcher et al., 2000; Rasmussen, 2005) because it contains elevated levels of U (generally >1000 ppm) and very low concentrations of initial common Pb, and commonly yields concordant and precise dates (Rasmussen, 2005).

The discovery of authigenic-diagenic xenotime in Precambrian rocks from the Ming Tombs district (Song et al., 2004; Song et al., 2014) will be favorable for geochronological determination of the Precambrian strata in North China.

There are abundant grains of authigenic-diagenic xenotime, forming irregular or pyramidal outgrowths on detrital zircon grains (Fig. 1a) dispersed throughout siltstone close to suture structure(s) of the Changzhougou Formation. The xenotime is very fine-grained, commonly occurring with a maximum dimension of less than 10 μm,

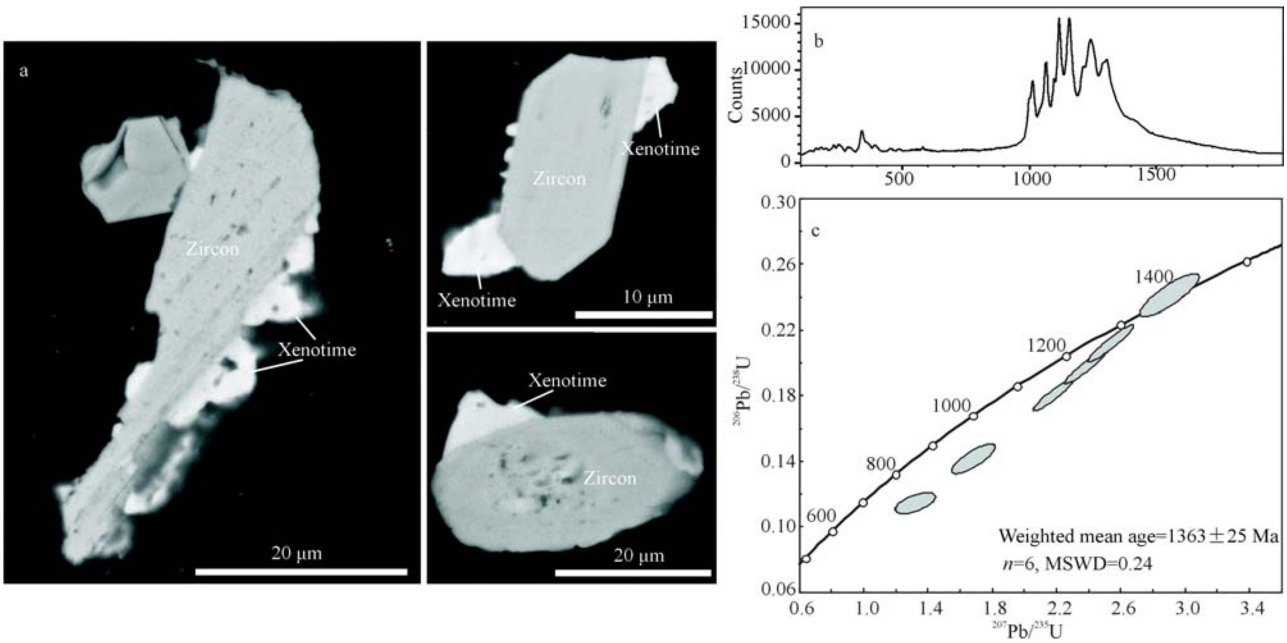


Fig. 1. (a), Xenotime outgrowth on detrital zircon grains from the Changzhougou Formation of the Ming Tomb district, Beijing; (b), Raman spectroscopy of the xenotime outgrowth; (c), *In situ* SHRIMP U-Pb age of the xenotime outgrowth.

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and this makes it almost impossible to be extracted from the rock samples using traditional crushing and separation techniques. Therefore, the rocks were crushed to a particle size of ~500 μm, and was then mounted in 20+ epoxy discs, polished, photographed in reflected light. The xenotime grains were identified using backscattered electron (BSE) imaging (Fig. 1a) and Raman spectroscopy (Fig. 1b).

An *in situ* isotopic technique with a spatial resolution of <10 μm was used to date the xenotime for its small size (Fig. 1a). Six analyses of xenotime that did not overlap zircon (no $ZrO_2^+$ counts were observed during analysis) yielded a weighted mean $^{207}Pb/^{206}Pb$ age of 1363 ± 25 Ma (MSWD = 0.24) (Fig. 1c).

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