In Situ U-Pb Dating of Wolframite by LA-SF-ICP-MS

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As main ore minerals, wolframite [(Fe,Mn)WO_4] series minerals occur in a broad variety of magmatic-hydrothermal tungsten and tin deposits and can potentially serve as direct U-Pb dating tools to constrain the tungsten mineralization age. Compared with other commonly used U-Pb dating minerals (e.g. zircon, monazite, titanite etc.), wolframite contains relatively low and variable U contents and thus much less radiogenic lead. Moreover, it usually is abundant in common Pb-rich inclusions. These problems can be properly avoided by using LA-SF-ICP-MS analytical technique due to its high signal sensitivity with moderate spatial resolution. In this study, we investigated over 20 wolframite samples from 17 locations around the world with ages ranging from ~26 Ma to ~1780 Ma. During our analysis, YGX-2113 and MTM^{LT} were used as our primary standards. Our obtained U-Pb data agree well with previously published age results. Additionally, the $^{186}W^{16}O$ significant interference of ^{202}Hg was first observed, indicating ^{204}Pb correction is unable and unreliable for wolframtie U-Pb measurement using LA-ICP-MS. there are no severe matrix effects between the different solid-solution members: ferberite ($FeWO_4$), hübnerite ($MnWO_4$) and wolframite. On account of rare inclusions and relatively low common Pb compositions, here we propose that YGX-2107, YGX-2113, MTM^{LT} can serve as primary reference materials for *in-situ* wolframite U-Pb dating. Sewa can be utilized as secondary reference materials because of the relatively low but variable common Pb composition. Thus, our in situ LA-SF-ICP-MS methodology illustrates the use of wolframite as a reliable U-Pb geochronometer with the advantages of fast and relatively low cost in situ analysis with moderate spatial resolution.