# RARE EARTH ELEMENT TRACING FOR THE ARCHEAN GOLD DEPOSITS IN THE KALGOORLIE-NORSEMAN REGION, WESTERN AUSTRALIA

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Rare earth element (REE) and other trace element abundances in 28 samples of scheelite(CaWO4), a widespreadaccessory mineral which is spatially associated with the gold ores in theArchean granite-greenstone hosted hydrothermal gold deposits in theKalgoorlie-Norseman region of Western Australia, have been determinedin-situ by excimer laser ablation inductively coupled plasma massspectrometry (ELA-ICP-MS) in order to constrain the composition and sourcesof the mineralizing fluids.The scheelites can be grouped according to the two distinct types ofchondrite-normalized REE (REEN) patterns which they exhibit: hump-shaped(Type-I) and flat (Type-II). Type-I scheelites have higher total and Naconcentrations than Type-II samples and can be further subdivided intoType-Ia which have maximum REEN concentrations between Sm and Gd, andType-Ib which have maximum REEN concentrations displaced towards Dy. Type-Ischeelites are dominant at Coolgardie, Kalgoorlie and Kambalda, whereasType-II samples are most abundant at Norseman.The distinctive REEN patterns and high Na contents of Type-I scheelitesimply that they crystallized from hydrothermal fluids with higher Naactivities than those that formed Type-II samples. Type-I scheelitesexhibit no changes in the size of the Eu anomaly with REE concentration,implying a predominance of Eu3+ and crystallization under relativelyoxidized conditions. Type-II scheelites have variable Eu anomalies andtrivalent REE concentrations and thus appear to contain mostly Eu2+ and tohave formed under reduced conditions. Type-Ia and Type-II scheelites have(Ce/Lu)N 1 and are interpreted to have crystallized from LREE-enrichedfluids, whereas Type-Ib scheelites with (Ce/Lu)N 1 formed fromLREE-depleted fluids. The range and distribution of fluid (Ce/Lu)N ratiosare similar to those of the major rock types in the region.