**Introduction**

Although the Olympic Dam deposit contains the world's largest recoverable uranium resources, 2013 marked a low in terms of new discoveries and exploration of uranium resources. The Olympic Dam (OD) deposit is located in the Murray-Darling basin, South Australia, and is one of the largest uranium deposits in the world. The deposit consists of a large, complex system of uranium-bearing veins and breccias that extend for more than 1 km in length and up to 300 m in width. The Olympic Dam deposit contains a variety of mineralizations, including uranium, gold, copper, and silver. The deposit is hosted in the Murdock Formation, which is part of the Olympic Dam Group, and is associated with a pre-existing basement complex of granitic and metamorphic rocks. The deposit is a result of a combination of tectonic, magmatic, and hydrothermal processes that have occurred over a long period of time.

**Geochemical signatures of uraninite from IOA deposits**

The Olympic Dam deposit contains a variety of uranium-bearing minerals, including uraninite, pitchblende, and coffinite. These minerals are associated with a variety of host rocks, including felsic and mafic volcanic rocks, metasedimentary rocks, and metasedimentary-volcanic rocks. The uranium minerals are typically found in veins and breccias, and are associated with alteration assemblages of quartz, feldspar, and mica.

**Comparative Analyses**

As presented by Fyfe and Taylor (2013), Figure 3 shows the relative abundance of rare earth elements (REE) in uranium deposits. The diagram is based on data from several studies, including those by Mercadier et al. (2011), which showed that the REE patterns of uranium minerals are controlled by the REE composition of the host rock, the degree of alteration, and the temperature of the hydrothermal system. The REE patterns of uranium minerals can be used to track the history of the hydrothermal system and to infer the temperature and pressure conditions under which the minerals formed.

**Preliminary Observations**

Preliminary observations of the Olympic Dam deposit indicate that the uranium mineralization is controlled by a variety of factors, including the host rock, the degree of alteration, and the temperature of the hydrothermal system. The REE patterns of uranium minerals are useful in tracking the history of the hydrothermal system and in inferring the temperature and pressure conditions under which the minerals formed.