



Reconnaissance of promising areas for sandstone type uranium deposits in the Urmia-Naqadeh-Mahabad basin, NW Iran

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Introduction

The Urmia-Naqadeh-Mahabad basin is a part of the south and west Urmia Lake drainage basin that covers some parts of East-and-West Azerbaijan and northern Kurdistan. This study is the integration of geological, hydrological, remote sensing, geochemical and airborne geophysical data classifying promising areas that are related to sandstone type uranium (U) mineralization in Iran. Based on positive factors such as favorable source, host rocks and suitable hydrological pattern, this basin is a favorable basin in Iran. According to the characteristics of lithology, tectonic, sedimentary environment, geotectonics and etc. the basin could be classified into favorable, promising and possible subbasins for mineralization of U sandstone type.

Material and methods

Geological data show that this region is a part of the Sanandaj-Sirjan zone and consists of Precambrian metamorphic rocks which are covered by younger sedimentary and volcano-sedimentary rocks that are influenced by different metamorphic phases. More than 7597 stream sediment samples from the area have been analyzed for Se, V, Mo, As, Cu, Ag, Zn, Co, Ni, Pb, Ti, Th, Zr, P and Sn. The basin is divided into 11 individual sub-basins. Radiometric data of the basin have been acquisitioned during 1976-1978 by an Australian-German- French Company with line separation of 500 meters and 120 meters of nominal terrain clearance.

Remote sensing data reveals that the western

subbasin is suitable for sandstone type uranium mineralization. Based on geochemical evidences, the Au, Zn, Sn, As and Pb elements were enriched. Geophysical investigation reveals that the Eastern basin includes high amounts of U and low amounts of Th. Hydrogeological study demonstrates that the trend of groundwater is from the west to the east.

Geochemical data revealed that we can divide the basin into 11 subbasins which are characterized as follows:

1. Ghara Aghaj (126 Km²), North to south trend is situated at the northern part of the basin. At this basin Ni, Co, Cu and V are reported but it is not related to mineralization.
2. Ghoma – Bezrgah (36 Km²). The East to the West trend is situated at the western part of the basin. At this basin Pb, As, Sn, Zn and Au are reported which can be related to skarn mineralization.
3. Piram – Shilan (342 Km²). At this basin Pb, Zn, As and Mo are reported which contain source rocks of uranium mineralization but there is no evidence of host rock and mineralization.
4. Pirestan1 (28 Km²). According to geological data a granitic body which can be the source of uranium mineralization and cretaceous volcanic rock outcropped. The fault system is weak by the north to the south trend. The anomalies of Pb, Mo, As and Sn are reported but there is no evidence of mineralization.
5. Kooh-e sabz poosh (34 Km²). Based on geological data half of the area is covered by granodioritic body which can be the source of

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uranium mineralization. The fault system has two trends (NE-SW and N-S). The anomalies of V, As, Mo and Co are reported but there is no evidence of mineralization.

6. Pirestan2 (83 Km²). According to geological data a granitic and granodioritic body can be the source of uranium mineralization. The anomalies of Mo, Sn, Co, As and Zn are reported but there is no evidence of mineralization.

7. Chahar Taq (36 Km²). The fault system has the NE to SW trend and trusted mechanism. The anomalies of Zn, Ni and Au are reported but there is no evidence of mineralization.

8. Zaveh Kooch (111 Km²). The rock units have the NW to SE trend according to the Sanadaj-Sirjan trend. The anomalies of Pb, As, Sn, Mo, Ti, Cu, Ni and Au are reported but there is no evidence of uranium mineralization but there is some evidence of orogenic gold mineralization.

9. Saqqez-Baneh (465 Km²). The rock units have the NW to SE trend according to the Sanadaj-Sirjan trend. The anomalies of Co, Ti, Cu, Zn, Pb, Ni, Mo, Sn, Ag, Au and As are reported but there is no evidence of uranium mineralization and the same as the 8th subbasin there are known deposits of orogenic gold mineralization.

10. Charkeh (104 Km²). The rock units have the NW to SE trend. The anomalies of Zn, Mo, Sn, V, Ni, Au, As and Pb are reported but there is no evidence of mineralization.

11. Sheikh Ebrahim (38 Km²). The anomalies of Mo, Au, As and Pb are reported.

The integration of the different layers shows that the prospecting area is suitable for future exploration of blind deposits.

Geophysical data was processed and revealed those areas which have data. They can be classified into 5 different classes based on U and Th concentrations.

The Hydrogeological data consist of EC, pH, Eh, DO and salinity. And the temperature was measured at the field by Sension 156 multimeter and was sent for ICP-MS analysis to the AMDEL and Applied Geological Research Center (Karaj) laboratories. Two samples were obtained from each well by Widel et al.'s (1998) method. One sample was analyzed for Ca²⁺, Mg²⁺, Na⁺, K⁺, CO₃²⁻, HCO₃³⁻, SO₄²⁻ and Cl⁻ and the other samples were analyzed for major and trace elements. At each basin charge, the discharge and the trend of underground water were defined .

Results

The results revealed that this basin contains alkaline magmatic rocks such as alkaline rhyolite and tuff which are situated in reduced shale and continental volcanic clastic rocks and can be the source of uranium at the study area. Besides these rocks, tuffaceous sandstone, metamorphose sandstone and young alluvial by the reduction condition can be the suitable hosts for mineralization.

Based on geological, geochemical, hydrogeological and geophysical data, the western basin is suitable for sandstone type uranium deposit and also there is some evidence of mineralization.