



Petrographic and geochemical analysis of the Givetian-Frasnian sandstones in the Kuh-e-Tizi section, southeastern Central Iran

S. H. Hejazi (A), M. H. Adabi (B), S. R. Moussavi Harami (C), and K. Khosro Tehrani (A)

(A) Department of Geology, Faculty of Sciences, Sciences & Researches branch, Islamic Azad University, Hesarak, Tehran, Iran, (B) School of Earth Sciences, Shahid Beheshti University, Evin, Velenjak Daneshjo Blv., Tehran, Iran, (C) Department of Geology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

The Givetian-Frasnian sandstones at the type section of Zarand Formation, *sensu* Wendt et al. (2002), unconformably overlie the Upper Cambrian Kuhbanan and underlie the Lower Carboniferous Hutk Formations respectively, in southeastern Central Iran.

Petrographical data show that these sandstones are well-sorted and sub-angular to rounded grains quartzarenite. They are highly enriched in quartz, but poor in feldspar, lithic fragments and heavy minerals. Diagenetic features include physical and chemical compactions (straight, concavo-convex, sutured grain contacts and pressure solution of quartz grain), reduction of the pore space through rearrangements, and cementation (mostly silica, as quartz overgrowth).

The provenance and tectonic setting of these sandstones have been interpreted using integrated petrographic and geochemical data. Petrographic analysis using standard methods (Basu et al., 1975; Dickinson et al., 1983) revealed that mono and poly-crystalline quartz grains have been derived from plutonic rocks of an interior cratonic setting. Elemental analysis and their ratios used for provenance studies (Th/Sc & La/Sc) which are similar to sediments derived from weathering of mostly felsic rocks (Armstrong-Altrin et al., 2004). Values representing chemical index of alteration (CIA) and the plagioclase index of alteration (PIA) range from 44.24 to 83.43, with an average of 69.96, and from 42.98 to 92.56, with an average of 75.8, respectively. However, most samples have values greater than 60, suggesting moderate to high weathering in the source area or during transportation prior to deposition.

Major and trace element concentrations indicated a depositional setting in a passive continental margin, resembling those defined by Bhatia (1983), Bhatia & Crook (1986), Roser & Korsch (1986) and Kroonenberg (1994). Therefore, it can be concluded that these sandstones have been derived from stable cratonic setting.

References:

Armstrong-Altrin, J.S., Lee, Y.I., Verma, S.P., Ramasamy, S., 2004. Geochemistry of sandstones from the Upper Miocene Kudankulam Formation, southern India: implication for provenance, weathering and tectonic setting. *J. Sediment. Res.* 74, 285–297.

Basu, A., Young, S.W., Suttner, L.J., James, W.C., Mack, G.H., 1975. Re-evaluation of the use of undulatory extinction and polycrystallinity in detrital quartz for provenance interpretation. *J. Sed. Petrol.* 45, 873–882.

Bhatia, M.R., 1983. Plate tectonics and geochemical composition of sandstones. *J. Geol.* 91, 611–627.

Bhatia, M.R., Crook, K.A.W., 1986. Trace element characteristics of graywackes and tectonic setting discrimination of sedimentary basins. *Contrib. Mineral. Petrol.* 92, 181–193.

Dickinson, W.R., Beard, L.S., Brakenridge, G.R., Erjavec, J.L., Ferguson, R.C., Inman, K.F., Knepp, R.A., Lindberg, F.A., Ryberg, P.T., 1983. Provenance of North American Phanerozoic sandstones in relation to tectonic setting. *Bull. Am. Geol. Soc.* 94, 222–235.

Kroonenberg, S.B., 1994. Effects of provenance, sorting and weathering on the geochemistry of fluvial

sands from different tectonic and climatic environments. Proceedings of the 29th International Geological Congress, Part A, 69–81.

Roser, B.P., Korsch, R.J., 1986. Determination of tectonic setting of sandstonemudstone suites using SiO₂ content and K₂O/Na₂O ratio. *J. Geol.* 94, 635–650.

Wendt, J., Kaufmann, B., Belka, Z., Farsan, N. & Karimi bavandpur, A. 2002. Devonian/Lower Carboniferous stratigraphy, facies patterns and palaeogeography of Iran. Part I. Southeastern Iran. *Acta Geol. Polo.* 52, 129-168.