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Kohistan of Pakistan is a collage of island arc, back-arc & continental margin settings: mafic dykes are the indicators

Tahseenullah Khan^{1*}, Mamoru Murata², Hafiz Ur Rehman³, Mohammad Zafar¹

¹Bahria University, Islamabad, Pakistan, ²Naruto University of Education, ³Kagoshima University

Kohistan island arc of Pakistan is squeezed as lensoidal mass between the Indian continent to the south and Karakoram micro-continent to the north. The delineating contacts are the suture zones known as the Main Mantle Thrust or Indus suture and the Main Karakoram Thrust or Shyok suture. The arc contains four major magmatic complexes: from bottom to top the mafic-ultramafic Jijal complex, mafic-ultramafic Sapat complex, mafic and ultramafic Chilas complex at the base, and the Kohistan batholith in the middle part. Back-arc basin rock assemblages, the Jaglot group, occur as septum within the Kohistan batholith. Mafic dykes are found to intrude the ultramafic and mafic rocks of the Chilas complex and the granitoids of the Kohistan batholith. Mafic dykes both basaltic and dolerites, intrude the slate, quartzite and gabbros of the Jaglot group. Petrographic and geochemical studies reveal variations in mafic dykes. Mafic dykes of the Chilas complex are primitive and range from picobasalt to basalt, tholeiitic and subalkaline. These dykes are mainly amphibolites. Mafic dykes of the Kohistan batholith are tholeiitic and calc-alkaline to alkaline and basaltic-andesite to trachy-andesite, which preserved trachytic-type texture. Mafic dykes of the Jaglot group are tholeiitic basalt and basaltic andesite, which preserved ophitic to subophitic texture. Mafic dykes of the Chilas complex are high in Al₂O₃, MgO, CaO, and low in Na₂O, K₂O, P₂O₅, Zr, Rb, Sr, Ba and Nb. Mafic dykes of the Kohistan batholith contain comparatively high Al₂O₃ and low TiO₂, Zr, Rb, Sr, Ba and Nb. The calc-alkaline/alkali basaltic mafic dykes are distinctly high in Na₂O, K₂O and P₂O₅, Rb, Sr, Ba, Nb and low in MgO, CaO, Fe₂O₃ and Y. Mafic dykes of the Jaglot group are distinct to contain high TiO₂, Fe₂O₃, Na₂O, Y, Zr and low Al₂O₃, K₂O, Rb, Sr and Ba. These dykes show flat pattern with slightly high HFSE/LILE ratios whereas the other dykes show sloping pattern with marked Nb depletion and Sr enrichment, when compared with N-MORB and primitive mantle values. Mafic dykes of the Jaglot group show enriched MORB-type affinity of back-arc basin origin whereas mafic dykes of the Chilas complex and the tholeiitic dykes of the Kohistan batholith give island arc type signatures. Calc-alkaline/alkali basaltic dykes give continental margin origin. All mafic dykes of the area are derived by the partial melting of depleted, heterogeneous mantle and enriched mantle sources during island arc, back-arc and continental margin tectonic settings.

Keywords: Kohistan, Island arc, Continental margin, Back-arc, Mafic dykes, Geochemistry