A note on the significance of granite clasts in a diamictite of the Thango Formation (Lower Silurian) Zanskar valley, Ladakh Himalaya

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Abstract

The presence of tourmaline bearing granite clasts in the diamictite of the Thango Formation (Lower Silurian) of the Haimanta Group, in Zanskar Valley of Ladakh, J & K State, suggests the existence of Pre-Silurian tourmaline granite in the Higher Himalaya.

Introduction

During a multidisciplinary expedition to Zanskar Valley in Ladakh district, Jammu and Kashmir State, in 1975, the present authors carried out geological mapping of the area, in the course of which, they discovered granite clasts in a diamictite of the Thango Formation (Lower Silurian) near Thangze Kogma. This represents the first report of such an occurrence from the Himalaya and the present note records its details and significance.

Geological set-up

The lithostratigraphic sequence of formations in the part of Zanskar Valley, is given in Table I.

From Giambal Gneissic Complex to the Haimanta Group there is no visible break and the sediments are largely welded to the basement. The Haimanta Group represents the earliest recognisable sedimentary cycle in the Tethys Himalaya and it constitutes a full cycle of geosynclinal sedimentation with the Batal Formation representing the euxinic stage, the Kunzam La (Lower) representing the flyschoid stage and the Thango, the molassic stage. The Haimanta Group has a stratigraphic range from Late Proterozoic to Lower Silurian with the Batal belonging to Late Proterozoic to Early Cambrian, the Kunzam La to Cambrian-Ordovician and the Thango to Early Silurian. The Haimanta Group has suffered a pre-Himalayan deformation as indicated by NE trending folds which are truncated by NW trending Himalayan folds. This earlier deformation is related to Late Caledonian phase and is referred as the Kurgiakh Orogeny by Srikantia *et al.* (1976).

Thango Formation: The purple quartzite, purple shale and siltstone together with diamictite constitute the diagnostic lithology of the Thango Formation. The purple quartzite shows large sized cross bedding with 50 cm to 1 m thick sedimentation unit and ripple marks indicating thereby a shallow environment of deposition. The purple shale of the Thango alternates with purple quartzite. It has poor fissility and at places is transformed into argillite. Another characteristic feature of the Thango Formation is the presence of several bands of diamictite together with calcarenite and dolomite. The diamictite band near Thangze Kogma contains clasts of tourmaline granite. The following is the lithological sequence of the Thango near Thangze Kogma:

7.	Purplish coarse grained sandstone with stray pebbles of purplish quartzite	1 m
6.	Purple conglomerate	2 m
5.	Purplish grey sandstone with sub-rounded stray pebbles and a pebbly unit of purple quartzite aligned along large scale cross beds	4 m
4.	Purplish medium grained sandstone	2 m
3.	Lenticular bed of conglomerate	1 to 2.3 m
2.	Purplish shale and siltstone	2 to 2.3 m
1.	Purplish conglomerate	3 m

The sedimentological analysis of Unit No. 1 which is the most dominant bed of diamictite is as follows:

Matrix-clast ratio: 70 : 30; clast size range: 2 to 20 cm, average being 10 to 15 cm; clast percentage: purple quartzite 85%, vein quartz 5%, dolomite 5%, granite 5%; frame work: compact to semiconsolidated; clast shape: rounded to sub-rounded rarely sub-angular: cement: calcareous.

TABLE I

LITHOSTRATIGRAPHIC SEQUENCE OF FORMATIONS IN ZANSKAR VALLEY

adapted after Srikantia 1973

Age	Group	Formation	Member	Lithology
Jurassic		Simokhambda		Massive to bedded limestone
	Lilang	Alaror		Shale, shaly limestone, quartzite
Triassic		Nimaloksa Hanse		Bedded to massive limestone Limestone and shale
		Tamba Kurkur	Upper Lower	Greyish blue to dark limestone Bedded limestone with chert
Permian		Kuling	Gungri	Carbonaceous shale and siltstone
			Gechang	Calcarenite
Lower Permian		Phe volcanics		Basaltic lava flows
		Ganmachidam		Diamictite, gritstone and quartzite
Carboniferous	Kanawar	Po Lipak		Quartzite and black shale Limestone, shale gypsum
Upper to Middle Devonian		Muth		White mottled quartzite
Lower Devonian to Upper Silurian		Takche		Ferruginous calcarenite and shale
		Thango		Purple quartzite, shale and diamictite
Lower Silurian to Late Proterozoic	Haimanta	Kunzam La	Upper Lower	Shale, siltstone, dolomite Shale, siltstone, turbidite quartzite greywacke
		Batal		Black pyritous shale with quartzite
Proterozoic		Reru (=Salkhala)		Metasediment and migmatite
		Giambal Gneissic Complex		Gneisses and metasediments
Base not exposed				
		ACID INTRUSIVES		
Gumboranjan Granite		Mainly tourmaline granite		Intrusive in the Batal and the Kunzam La
Mansingh Granite		Mainly biotite granite		Intrusive in the Batal
Choshirok Granite		Mainly biotite and also tourmaline granite		Intrusive in the Giambal complex and Reru

The presence of large percentage of purple quartzite which is also the conspicuous litho-unit of the Thango Formation indicates a cannibalistic nature of diamictite and also the prevalence of strong tectonic disturbance at the time of sedimentation.

Tourmaline granite clasts: The most significant feature of the Thango Formation near Thangze Kogma is the presence of clasts of tourmaline granite and also of tourmaline bearing vein quartz. In thin section, the granite shows a medium-grained, hypidiomorphic granular texture, consisting principally of quartz and feldspar. Quartz occurs mostly as anhedral grains. Feldspars are mostly of potash type and there are also albite-oligoclase feldspars. They show polysynthetic, albite and carlsbad type twinning. The twin lamellae is bent in some sections indicating strain effects. The feldspars are generally sericitised. The accessory minerals are tourmaline, muscovite, sericite and apatite. Tourmaline is abundant and tends to occur in long prismatic crystals with irregular fractures. Muscovite shreds are also common.

The occurrence of tourmaline granite clasts in a diamictite of Lower Silurian age is the first such record from the Himalaya. This discovery dispels the presently held view that all tourmaline granites in the Himalaya belong to Tertiary era. Further, the present occurrence also proves the existence of a pre-Silurian tourmaline granite in the Tethys Himalaya as well.

It is possible that the Gumboranjan granite intrusion in the Kuzam La Formation (Ordovician-Cambrian) of the Haimanta Group which is the nearest granite outcrop is the source rock. This aspect together with the cannibalistic nature of the Thango diamictite brings out a remarkable correlation between geosynclinal cycle of sedimentation, granite intrusion (Gumboranjan granite) and orogeny (Kurgiakh orogeny).

Conclusion

The occurrence of tourmaline granite clasts from a diamictite of the Thango Formation (Lower Silurian) proves the existence of pre-Silurian granite in the Higher Himalaya of Ladakh and it is not correct to refer all tourmaline granites of the Himalaya as related to the Himalayan Orogeny. It is probable that the granite clast referred in this paper was derived from a granite which was related to the Kurgiakh Orogeny (Caledonian).

References

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