Journal of Conference Abstracts
Volume 5(2), 135

Saddle Shaped $^{40}Ar/^{39}Ar$ age Spectra and Muscovite Recrystallization

Pavel Alexandrov[1], **Gilles Ruffet** (ruffet@hermes.unice.fr)[2], **Alain Cheilletz** (cheille@crpg.cnrs-nancy.fr)[1] & **Gilbert Féraud**[2]

[1] CRPG-CNRS, BP 20, 54501 Vandoeuvre Cedex, France
[2] Géosciences AZUR, 28 Av. de Valrose, 06108 Nice Cedex, France

The Blond leucogranitic massif represents one of the last intrusions of the Hercynian orogenesis in the Limousin, French Massif Central. Its emplacement is dated at 319±7 Ma (U/Pb ion probe zircons ; Alexandrov et al., 2000). It is characteristic of the period of magmatic activity associated with late-orogenic extension, which occurs in the Limousin during Upper Carboniferous (Namurian).

The Blond granite is located about 30km to the northwest of Limoges. At its southwest border it is separated from the Glane granite by the Oradour fault. To the southeast it intrudes the Cieux-Vaulry granite. Four kilometres further to the north outcrops the metamorphic Upper Gneiss Unit which is represented by plagioclase rich paragneisses with amphibolitic intercalations.

Petrographical (Barbier, 1967) and geochemical studies have shown that the Blond granite is concentrically zoned, with three main facies: internal, annular and external. Further, these major facies are intruded by minor coeval ones: a muscovite granite on the western extremity of the massif, and a biotite-muscovite granite with small phenocrysts to the south. Pegmatite, aplite and microgranite dikes and veins crosscut all of the previously mentioned facies.

Muscovite single grains from 12 samples have been analysed by the $^{40}Ar/^{39}Ar$ method. Three sample analyses have been duplicated, and two triplicated. The obtained plateau ages range between 305.8 ±0.9 and 311.8 ±2.0 Ma. The same age scattering is present in the duplicated and triplicated analyses. Almost all of the age spectra are slightly saddle shaped (Figure 1A), with a difference of 0.5% between ages from the first or last steps (oldest ages) and the middle-temperature steps (youngest ages).

These analysed muscovites have been studied under optical microscope and through scanning electron microscope (SEM). All muscovites are slightly deformed, and disturbed zones are visible on the edges of the grains (Figure 1B). Chemical analyses of these "different" zones of the muscovites show that the disturbed zones display a higher degree of phengitic replacement with lower Na and higher F concentrations. Thus these zones were apparently recrystallized under the action of fluorine-rich fluids.

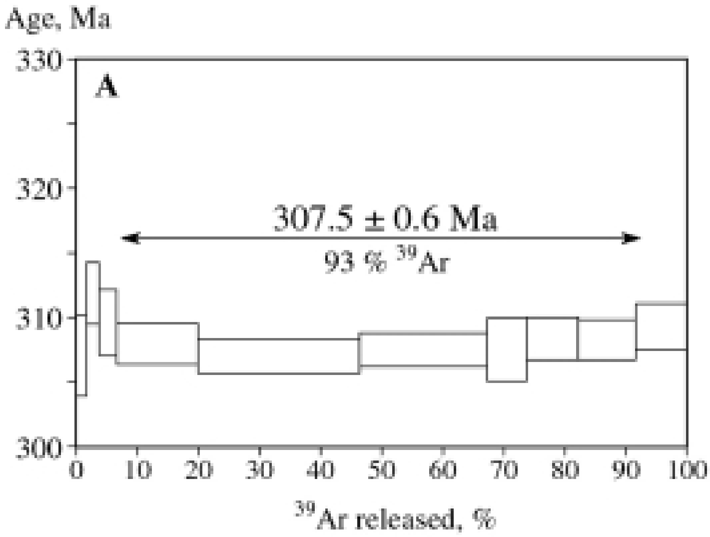
The magmatic and metamorphic host-rocks of the Blond leucogranite have also been dated by the $^{40}Ar/^{39}Ar$ method. The ages obtained are higher than the emplacement age and the $^{40}Ar/^{39}Ar$ ages from the Blond granite. This means that the Blond granite intruded " cold " host-rocks. This implies that the cooling age of the leucogranite should be close to the emplacement age, but this is not the case: the $^{40}Ar/^{39}Ar$ ages are ca.10 Ma younger than the emplacement age. Thus, a contradiction appears between the emplacement (and probably cooling) age and the $^{40}Ar/^{39}Ar$ ages.

This apparent contradiction, as well as the age spectra shape and the age dispersion can be explained by the model proposed by Cheilletz et al. (1999) or Tremblay et al. (2000) which explains saddle shaped age spectra by the partial recrystallization of the primary muscovites and the existence of three different isotopic components: (i) inherited (primary) muscovites with an isotopic compositions which tends towards the primary isotopic composition and which display the high ages in the high-temperature steps (ii) recrystallized zones which yield the low ages in the middle temperature steps representative of the recrystallization event (iii) a "low temperature" component with high ages in the first degassing steps which can be explained either by a recoil phenomenon or more probably by degassing of inherited argon trapped in defects related to the development of the recrystallized/phengitic zone.

In the case of the Blond leucogranite, this model is supported by several arguments: (i) the saddle shape of the age spectra; (ii) the observed and characterised phenomena of phengitic recrystallization of the muscovites; (iii) the age variation throughout the leucogranite and within individual samples ; (iv) the chemistry and petrography of the intrusion.

Thus, it seems that the obtained $^{40}Ar/^{39}Ar$ ages do not express cooling of the intrusion, but more probably later fluid circulations responsible for the partial phengitic recrystallization of muscovites. These fluid circulations occur probably at or after ca. 306 Ma, the youngest ages obtained on the lowest part of the saddle shaped age spectra being a maximum estimation of the age of the disturbing event.

Journal of Conference Abstracts
Volume 5(2), 136



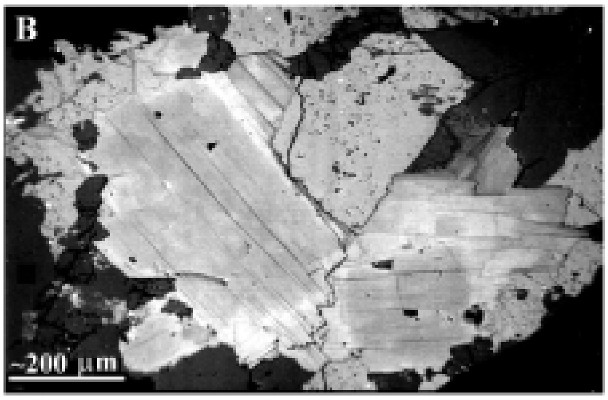


Figure 1. A: Typical saddle-shaped age spectrum; B: SEM image with dark (undisturbed muscovite) and bright (phengitic recrystallization) zones.

Alexandrov P, Cheilletz A, Deloule E & Cuney M, *C. R. Acad. Sci. Paris*, **330**, 1-7, (2000).
Barbier J, *Sci. Terre, Nancy*, **XII-3**, 183-206, (1967).
Cheilletz A, Ruffet G, Marignac C, Kolli O, Gasquet D, Féraud G & Bouillin JP, *Tectonophysics*, **306**, 97-116, (1999).
Tremblay A, Ruffet G & Gastonguay S, *SGA Bulletin*, **112**, 136-146, (2000).