Origin of carbonic anhydride in the mineral springs of the *Circuito das Águas*, State of Minas Gerais, Brazil

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The waters of the mineral springs of Caxambu, Cambuquira, Lambari, São Lourenço and Águas de Contendas are known for their digestive therapeutic qualities and for their high carbonic anhydride content. Hydrological study was carried out in 1998 aiming to defining the genesis of these waters with a view to delimiting areas for environmental protection. The springs are situated over Archaean gneissic rocks assigned to the Alto Rio Grande Belt and the Socorro-Guaxupé Nappe, associated with shear zones and alkaline volcanic rocks. The springs occur in thin Cenozoic alluvial sediments, overlain by beds of clay, rich in organic material up to 9m thick that confine the fractured aquifers. The waters are of the bicarbonate type, containing up to 1.55 mg/l HCO_3. They are alkaline, and contain high levels of sodium and potassium. They are cold and contain carbonic gas with up to 4500 mg/l CO_2. They may be radioactive or non-radioactive, acid to slightly acid, ferruginous rarely sulphurous and contain a dry residue between 20.0 mg/l and 1480.50 mg/l.

The mineralization of these waters has resulted from the dissolution of feldspathic minerals present in mylonitized zones and in the volcanic rocks situated near the springs. The large amount of carbonic anhydride results from the contact between waters rich in bicarbonate of the fractured aquifers with argillaceous sediments rich in organic material in the zones of discharge. The environment of acid pH created the physical and chemical conditions for the formation of carbonic anhydride and the bicarbonate present in the waters.