Activation Energy of Kaolinite Dehydroxylation of Brazilian Central Plateau Latosols

Éder de Souza Martins, Adriana Reatto-Braga, Ary Bruand, Euzebio Medrado da Silva, Osmar Abilio de Carvalho Jr

Activation Energy of Kaolinite Dehydroxylation of Brazilian Central Plateau Latosols

Eder S. Martins[1], Adriana Reatto[1, 2], Ary Bruand[2], Euzébio M. Silva[1], Osmar Abílio Carvalho Jr.[3]

[1]Empresa Brasileira de Pesquisa Agropecuária (Embrapa Cerrados), BR 020, km 18, 73310-970, Planaltina, Distrito Federal, Brazil (Adriana.Reatto@univ-orleans.fr); [2]Institut des Sciences de la Terre d'Orléans (ISTO) UMR6113 CNRS/Université d'Orléans 1A, rue de la Férollerie 45071 Orléans, France Cedex 2; [3]Universidade de Brasília, Departamento de Geografia, Campus Darcy Ribeiro, Asa Norte, Brasília, CEP 70910-900, Brazil.
Communicating author: eder@cpac.embrapa.br

The Brazilian Central Plateau Latosols occurs on Tertiary South American and Velhas planning surfaces. The purpose of this work was to determine activation energy of kaolinite dehydroxylation and its genesis relationships of the Brazilian Central Plateau Latosols.

Ten Bw horizon samples of Latosols were selected along 350 km regional toposequence across the South American Surface (L1 to L4) and Velhas Surface (L5 to L10), Figure 1.

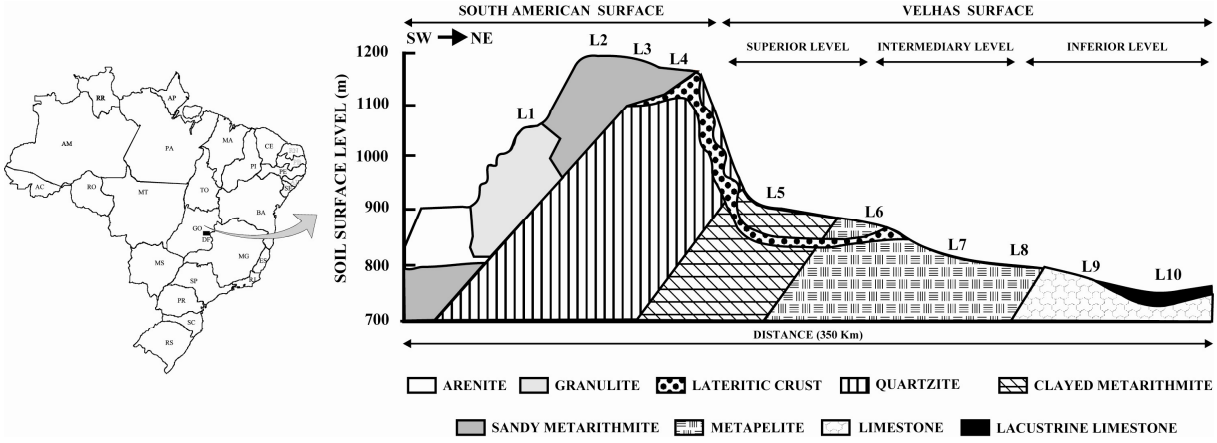

Figure 1 - Position all sampling of the 10 Latosols (L) in each geomorphic surface in the regional toposequence of Central Plateau - Brazil.

Chemical composition obtained after dissolution in sulfuric acid was used to estimate the kaolinite, gibbsite, goethite and hematite content. Goethite and hematite content was also estimated using the soil color (hue, value and chrome).

The proportions of kaolinite and gibbsite in clay fraction were determined by thermogravimetric analysis (TG) with Shimadzu thermobalance, model TGA-50H, N_2 atmosphere. The TG curves were obtained between environmental to 1,000 ^oC, with heating rate of 10 ^oC min^{-1}. The apparent activation energy of kaolinite dehydroxylation (*EaK*) was determined by the slope of the straight line in an Arrhenius plot that relates the logarithm of the reaction speed (% of mass loss), in the thermogravimetric analysis, with the inverse of the absolute temperature (1/T) (Speyer, 1994).

The results showed that EaK varies between 55 and 122 kJ mol^{-1} for South American Surface samples, and between 106 and 154 kJ mol^{-1} for Velhas Surface samples. The EaK shows a linear behavior to kaolinite/(kaolinite + gibbsite) ratio (*RKGb*).

A positive relation was obtained for South American Surface:

$$EaK = 4.0419\ RKGb - 75.063,\ (R^2 = 0.99)$$

Otherwise, a negative relation was obtained for Velhas Surface:

$$EaK = -2.7282\ RKGb + 364.21,\ (R^2 = 0.95)$$

These *EaK* behaviors can be related to parental material composition and the relative weathering intensity among South American and Velhas Surfaces.

Reference:

SPEYER, R.F. (1994): Thermal Analysis of Materials, Marcel Dekker, Inc, New York, 1994.