

Postmagmatic alteration of a basaltic lava flow of the Estância Velha Region RS, southeastern Paraná Basin, Brazil

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In the subaerial Estância Velha lava flow, near Porto Alegre (RS), secondary minerals are dominantly clay minerals and zeolites. The clay minerals are saponite, chlorite/saponite mixed-layer and celadonite. The celadonite replaces olivine and fills vesicles, whereas saponite and chlorite/saponite mixed-layer clays crystallized in the interstitial mesostasis and vesicle cavities. The zeolites are mostly Ca-Na zeolites and Ca zeolites, and replace albitized plagioclases and infill vesicles cavities. The most abundant zeolites are heulandite, scolecite, stilbite, mesolite, thomsonite, laumontite and mordenite. The calcic plagioclase (An_{42-70}) was replaced by zeolites and albite and may have released the ions for the zeolite crystallization in the adjacent vesicles and voids.

Postmagmatic alteration occurred mostly in the top and bottom vesicular levels of the flow and corresponds to secondary phases formed after crystallization of early-formed anhydrous minerals. Postmagmatic alteration may be related to dissolved water and water exsolved into vesicles which was concentrated during the final stages of crystallization process and cooling of the flow.

The cooling time for the solidus temperature of this 45m thick flow to drop to ambient temperature, according to the conductive thermal model results, was approximately 560 yr. and this may be the available time for the postmagmatic alteration processes.