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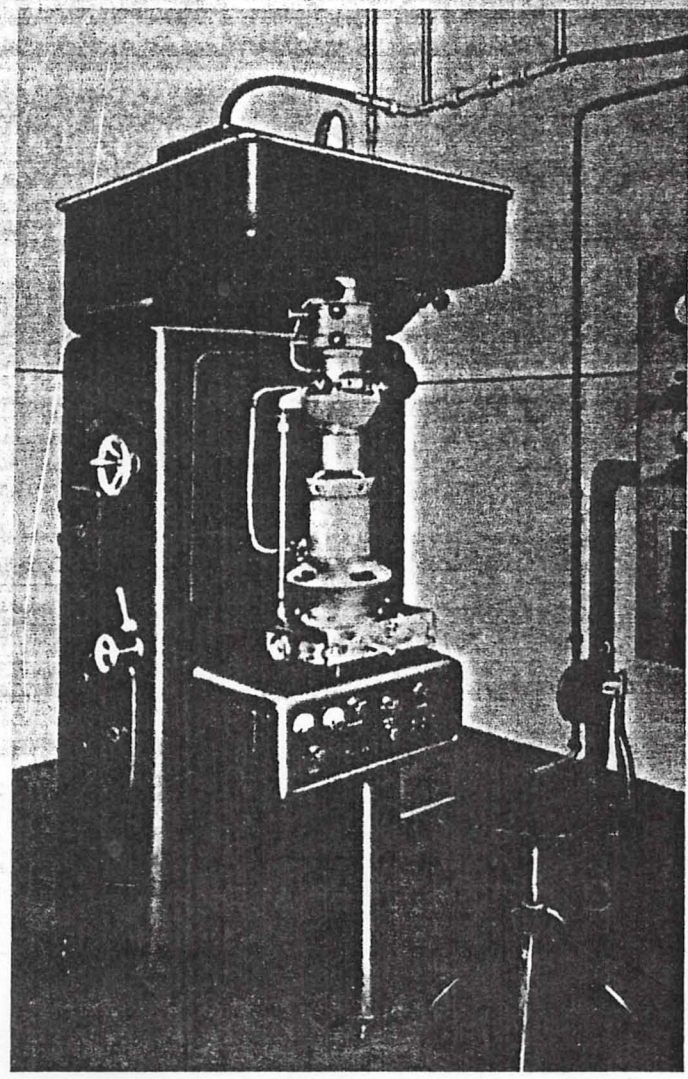

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OPAL-BEARING SANDSTONES AS POZZOLAN MATERIAL

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Opal is a natural substance with high pozzolanic activity, that is to say, it reacts with calcium hydroxide in the presence of water at room temperature resulting in compounds with cement properties.

For its importance as an active component, the occurrence of opal was investigated during the search for pozzolan in the State of São Paulo[1]. During this work sedimentary rocks containing opal and chalcedony were identified in the top of the Serra do Itaqueri, north of the city of Itaqueri da Serra. They constitute rudaceous deposits with sandstones and mudstones attributed to the alluvial fans[2] of the Itaqueri Formation. This lithological unit occurs in the top of scarps that reach altitudes of about 1000 m and it is placed on the basalts of the Serra Geral Formation, or directly on the Botucatu Formation, when the basaltic rocks are absent[3]. Sandstones present a great variation in granulometry and frequently have dispersed granules in an argillaceous matrix. Sandstones are composed mainly by quartz and the accessory minerals are muscovite, tourmaline and feldspars. The intergranular filling cement, characteristic of a process of interstitial silicification, is constituted by chalcedony and opal. Genesis of the Serra de Itaqueri opal, would be related with hydrothermal activity synchronous with the clastic sedimentation[4]. Opal would be formed from silica-rich thermal waters penetrating fractures of the intersection zones of great fault alignments in the State of São Paulo. Petrographic study of the opal-bearing sandstone showed isotropic opal matrix under crossed polarizers. X-ray diffraction analysis allowed the visualization of a band representative of amorphous material between 20 to 24° 2θ. SEM images (Figures 1-2) show botryoidal forms for the opal from the silicified sandstone. Physical characterization and the indexes of pozzolanicity with calcium hydroxide (4.1 MPa) and cement (79%) in 7 and 28 days, respectively, indicate that the material is a natural pozzolan. The results are highly favorable to the employment of opal-bearing sandstones in the cement industry, but the occurrence of opal in the sedimentary rocks of the Paraná Basin is limited in area and rare.

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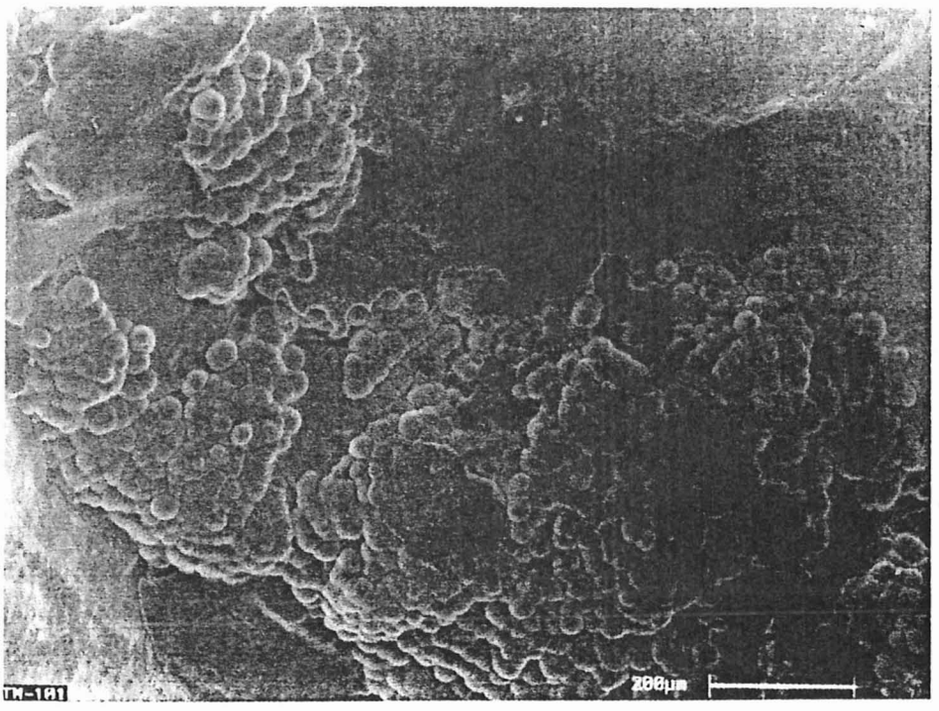

Fig. 1: General view of the opal botrioidals forms in a opal-bearing sandstone of Serra do Itaqueri.

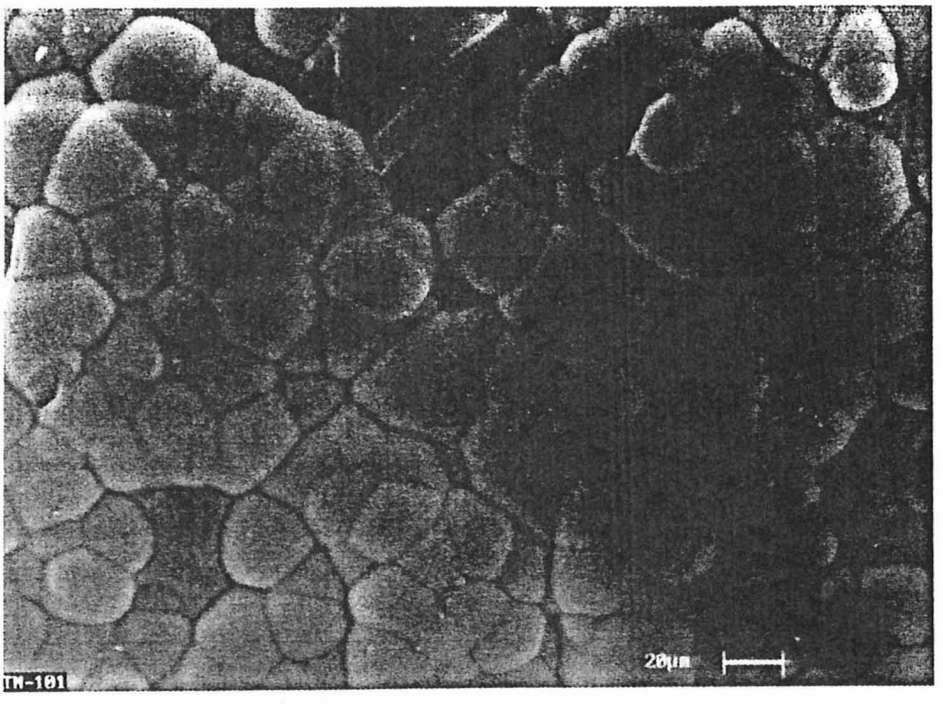

Fig. 2: Detail of the opal botrioidals forms in a opal-bearing sandstone of Serra do Itaqueri.