GEOLOGICAL AND TECHNOLOGICAL EVALUATION OF BALL AND PLASTIC CLAY IN BRAZIL

José Francisco Marciano Motta[(1)], José Carlos da Silva Portela[(1)], Antonio Carlos de Camargo[(1)], Carolina Del Roveri[(2)], Marsis Cabral Junior[(1)], Luiz Carlos Tanno[(1)], Maria Margarita Torres Moreno[(2)], José Mario Coelho[(3)]; Antenor Zanardo[(2)]

[(1)]IPT – Instituto de Investigación Tecnológica de São Paulo State.
São Paulo - Brasil
[(2)]Departamento de Petrología y Metalogenia.
Universidade Estadual Paulista - Unesp – Rio Claro – Brasil
[(3)]Departamento de Geología de la Universidade Federal do Rio de Janeiro.
UFRJ – Brasil
jfmotta@ipt.br; portela@ipt.br; camargoc@ipt.br; cdroveri@rc.unesp.br;
marsis@ipt.br; tanno@ipt.br;; mmoreno@rc.unesp.br;
zemario@geologia.ufrj.br; azanardo@rc.unesp.br

1. INTRODUCTION

Ball and plastic clays is a clayey material constituted by kaolinite, illitic mica, or sericite, fine quartz and other minerals, with small amounts of organic matter, that play an important role in the worldwide ceramic industry providing strength, plasticity, light cream to white fired colour and others special characteristics for sanitary-ware, floor and wall tile, tableware, electric insulator, refractories, glaze and frits. In addition, plastic clays have other non-ceramic usages such as coating or filler in rubber, adhesives, sealants and fibreglass.

The major users of plastic clay are the sanitary-ware, wall and floor tile producers. Only for the tile industry the estimated consumption is over 10 million tons of plastic clays yearly, and demand is going up for the coming years, mainly for porcelain stone production.

Brazilian ceramic tile industry produces around 600 million square meters of floor and wall tiles by year, including 33 million of porcelain stone and around 130 million of other white body tiles. It requires a domestic supplying of around 1 million tons of plastic clay per year. In spite of the small amount of porcelain tile produced in Brazil, its production is growing rapidly (18% in the period of 2004-2005). This fact will demand more plastic clay each year.

This paper deals with an evaluation of Brazilian plastic clays to supply present and future market. The study involved several deposits in the country and around 40 samples were selected for detailed investigation on mineralogy, chemical composition, ion exchange capacity, carbon content, particle size distribution and ceramic properties.

After showing these characteristics and properties of individual samples and deposits, this paper discusses their relationship with the geological setting and evaluates the potential for ball and plastic clay in Brazil.

2. STUDY METHODS

Data collecting and preliminary analysis for occurrences selection; field works: geology of deposits and sampling; laboratory studies; particle size distribution; chemical analyses; mineralogical studies; and ceramic experiments.

3. RESULTS AND DISCUSSION

3.1. PHYSICAL CHARACTERISTICS - PARTICLE SIZE DISTRIBUTION (FIGURE 1)

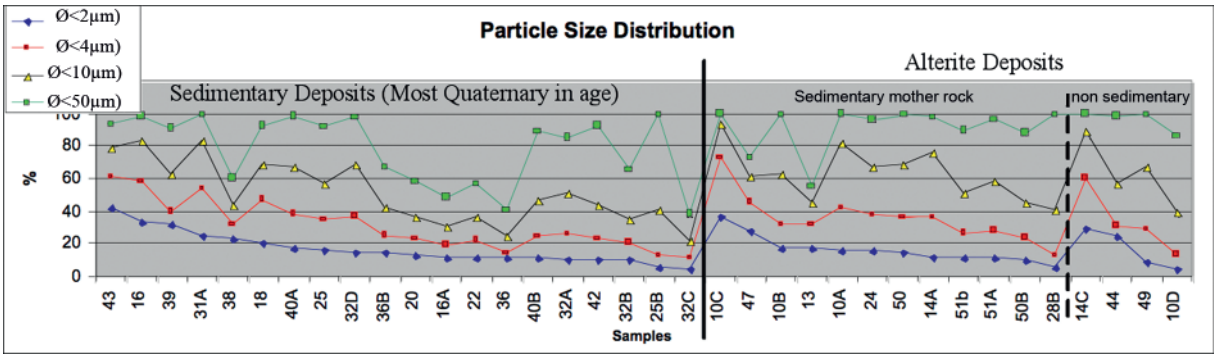

Figure 1. Particle size distribution according to sedimentary and alterite clay type

3.2. CHEMICAL CHARACTERISTICS (FIGURE 2)

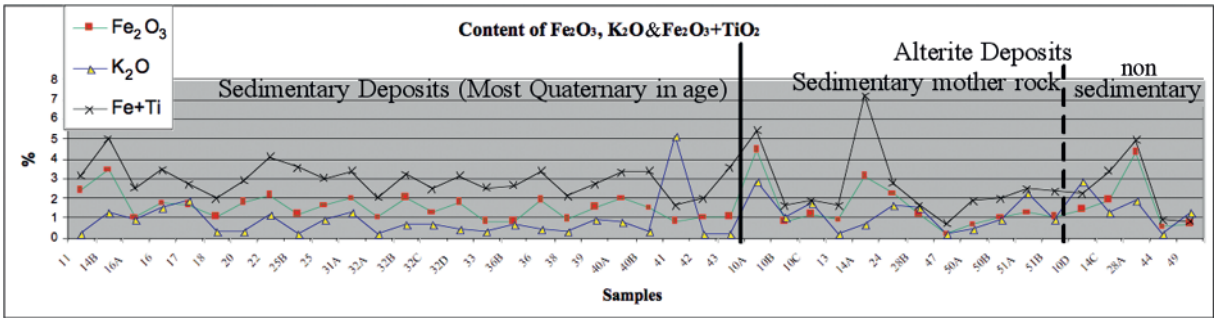

Figure 2. Iron, potash and titanium oxides distribution in the samples according to deposit types

3.3. CERAMIC PROPERTIES (FIGURE 3)

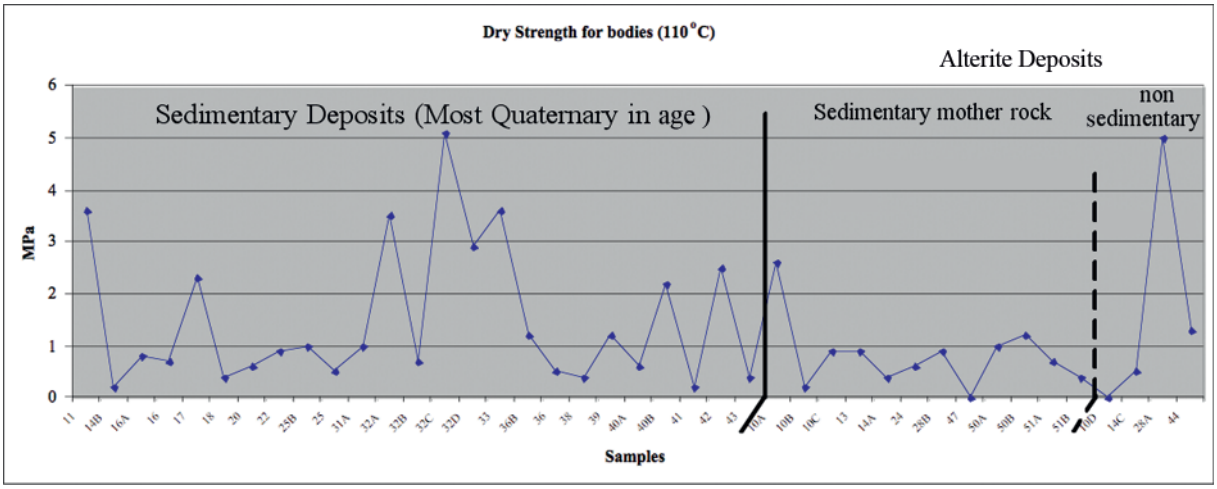

Figure 3. Dry strength for clay samples according deposit types

4. CONCLUSIONS

This study pointed out several deposits of plastic clay with good qualification for white ceramic, such as porcelain stone tiles

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REFERENCES

[1] Dens., T.F, Vincent, T. 1997. Ball cay development in the Americas. Mining Engineering. Feb. 1997. p.30-33.

[2] DNPM – Departamento Nacional da Produção Mineral 2006/07. Anuário Mineral Brasileiro, Cadastro Mineiro, Sigmine, Sumário Mineral. São Paulo. Disponíble en http://www.dnpm.gov.br Consulta 2006/2007.

[3] Millot, G. 1964. Géologie des argiles. Paris: Masson et Cie. Éditeurs, 499 p.

[4] Motta, J.F.M., Tanno, L.C., Cabral Jr, M. 1993. Argilas plásticas para cerâmica branca no Estado de São Paulo - potencialidade geológica. Rev. Bras. Geocênc.,23 (2):158-173.

[5] MOTTA, J.F.M.; COELHO, J.M.; CABRAL JR, M.; ZANARDO, A.;TANNO, L.C. Raw material for porcelainized stoneware tiles ceramic bodies in Brazil. Tile & Brick International Freiburg – Alemania, v.18, p 358 – 362, 2002.

[6] Motta, J.F.M.; Zanardo, A.; Cabral Jr., M.; Tanno, L.C.; Cuchierato, G. As matérias-primas plásticas para cerâmica tradicional. Argilas e Caulins – Cerâmica Industrial, 9 (2) marzo/abril, 2004, pp 33 – 46.

[7] Motta, J.F.M. 2007. Estudo da tipologia e caracterização geológico-tecnológica de depósitos de argilas plásticas e o desenvolvimento de massas para cerâmica branca. Relatório Final (Processo Fapesp 2003/13762-4). São Paulo. Texto (100 p.), figuras e anexos.

[8] Souza Santos 1975. Ciência e Tecnologia das Argilas. Ed. Blucher. São Paulo, Brasil. 2 vol. P. 802.-