of *Simulium* and *Aedes*, vectors of onchocerciasis and dengue, respectively, while, *Bs* is very effective for controlling *Culex* species, vectors of filariasis and encephalitis. Data from the operational use of microbial larvicides in several countries, in the past two decades, have confirmed the effectiveness of *Bti* and *Bs* and their safety to non-target species. On the other hand, *Culex* populations intensively sprayed with *Bs*, can display resistance. Data shows that *Bs* should be used into integrated programs with other control agents such as *Bti*, in order to avoid these phenomena. Resistance is unlikely to appear towards *Bti* due to its multiple toxins. — (*May 24, 2002*) .

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X-RAY DIFFRACTOMETRY APPLIED TO THE COMPARATIVE STUDY OF PROCESSES OF FORMATION OF AUTOMOTIVE BATTERIES

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Presented by Valderez P. Ferreira

X ray diffraction was applied to the investigation of the main steps in lead acid battery production (mixing, soaking and formation) in order to improve manufacturing conditions and to contribute with a theoretical understanding of these processes.

In the first step, mixing, the following results were obtained: (a) liquid nitrogen freezing of the paste was effective; (b) the reaction was instantaneous; (c) it is directly related to the amount of acid added.

In the soaking step, plates with a high content of total sulfate display a final monobasic lead sulfate content bigger than those displayed by plates with low content of total sulfate. In order to explain this behavior, two hypotheses are proposed: (a) 3BS could lead to monobasic sulfate crystallization; and (b) 1BS initially present in the plates could act as seeds for further crystallization. Crystal sizes were also followed as a function of time during the soaking period, demonstrating the possibility of extending the use of X-ray diffraction in the observation of crystal sizes in this and any other step of battery production.

In continuous current formation it was observed that higher temperatures (60^{o}C) are favorable, affected by an increase in current and especially by the interaction: increase in current vs. increase in density. The best results of plate formation were obtained with plates rich in tribasic lead sulfate. It was found that the total charge used in the industry is too high and a reduction of up to 43% of the charge yields excellent results, with PbO$_2$ contents as high as 92% with an average of 80%.

A laboratory test of pulsed formation showed that longer time is the main factor in order to achieve better results, moreover longer pulses in experiments with short times also yield higher contents of PbO$_2$.

In a comparison of both formation schemes it was observed that pulsed formation was more efficient, with respect to total PbO$_2$ obtained, with plates richer in tetrabasic sulfate. In continuous formation, under the same experimental conditions, no tetrabasic sulfate remains unformed. — (*May 24, 2002*) .

OXYGEN ISOTOPES INTERNAL EQUILIBRIUM IN MAGMATIC EPIDOTE-BEARING GRANITOIDS

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In this study we present oxygen isotope compositions of mineral separates from three metaluminous epidote-bearing granitoid series from northeastern Brazil.

Zircon has an overall δ^{18}O variation of $\sim$ 5‰, ranging from 5.72‰ to 10.30‰, but is very homogenous within a single pluton. The highest values of δ^{18}O (zircon) (9.88‰ ± 0.35‰; n = 13 samples) are for the calc alkalic granitoids, which are slightly, but significantly higher than those for high-K calc-alkalic granitoids (9.10‰ ± 0.41‰; n = 19 samples) with little overlap. Values for these granitoids greatly differ from the average for the shoshonitic granitoids (7.43‰ ± 0.19‰; n = 5 samples), and from that for the São Rafael pluton, a high-K calc-alkalic granitoid (5.92‰ ± 0.26‰; n = 9 samples). These differences repeat for the other analyzed minerals, with little overlap of values. There is a good positive correlation between mineral pairs in the three series, although quartz-epidote and zircon-epidote fractionations are higher than predicted for equilibrium at magmatic temperatures. Measured mineral-mineral fractionations suggest continuous sub-solidus inter-mineral isotope exchange among all minerals except zircon. Calculated δ^{18}O (magma) values using whole rock SiO$_2$ contents and δ^{18}O (zircon) values are up to 1‰ lower that those calculated using $\delta^{18}O$ (quartz); values of $\delta^{18}O$ in zircon are interpreted to provide the best evidence of magmatic value. Oxygen isotope fractionation between natural zircon and magmatic epidote is opposite to that predicted from theoretical determinations, as in all analyzed samples $\delta^{18}O$ (epidote) $<$ $\delta^{18}O$ (zircon). The systematic mineral-epidote fractionations suggest that epidote cooled in a closed system, and is magmatic in origin. — (*May 24, 2002*) .

CHROMITITES ASSOCIATED WITH LAYERED COMPLEXES IN BRAZIL: TESTING "ONE-FIT-ALL" GENETIC MODELS

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Presented by Alcides N. Sial

Chromitites represent a special case of cumulate rock where chromite is the only cumulus phase. Formation of chromitites thus requires that phase relations of the appropriate system are somehow changed to allow the system to fall into the chromite stability field. Several "one-fit-all" models were proposed to explain the origin of chromitite layers.

Mineral chemistry data were collected for three layered intrusions in Brazil; Bacuri Complex (Amapá), Ipueira-Medrado Sill (Bahia) and Niquelândia Complex (Goiás). They have distinct igneous stratigraphy, thus providing opportunity to look at chromitites formed in different environments.

At the Bacuri Complex, most of the chromite is concentrated in a single few meters-thick chromitite layer located at the base of the Ultramafic Zone (UZ) in direct contact with the underlying Lower Mafic Zone. Cryptic variation data is consistent with extensive fractionation within the UZ. The stratigraphic position of the main chromitite strongly supports a model for its origin associated with a major new influx of primitive magma, and mixing with more fractionated resident magma.

At the Niquelândia Complex, chromitites consist of several few centimeters-thick layers restricted to a 20 meters-thick horizon within an estimated 3 km-thick Ultramafic Zone. Detailed cryptic variation data indicate that the 20 meters-thick interval marks a slight reversal of the fractionation path. The data support a model for its origin associated with new influx of primitive magma, and mixing with slightly more fractionated resident magma.

At the Ipueira-Medrado Sill, a 5-8 meters-thick massive chromitite layer (MCL) is hosted by a 200-300 meters-thick layered intrusion. The MCL is located at the transition from dynamic open system to mainly closed system magma chamber. The most primitive compositions are observed at the MCL. Cryptic variations are the opposite to what is expected as the result of a new influx of primitive magma. Re-Os and Sm-Nd data indicate strong crustal contamination suggesting that chromite crystallization was triggered by changes of physical conditions associated to crustal contamination.

The data indicate that the chromitite layers are always associated with major changes in the magmatic chamber. However, a single genetic model does not apply to the three examples investigated. — (*May 24, 2002*) .

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FAST ENVIRONMENTAL IMPACT ASSESSMENT THROUGH ICP-MS: APPLICATION TO BIVALVES FROM A TROPICAL ESTUARY (PINA BAY, RECIFE, BRAZIL)

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The use of the semi-quantitative analysis in environmental impact assessment studies was evaluated through a comparative study using quantitative and semi-quantitative operational modes in ICP-MS. Twenty one elements, namely, ^{7}Li, ^{11}B, ^{27}Al, ^{48}Ti, ^{51}V, ^{52}Cr, ^{55}Mn, ^{58}Ni, ^{59}Co, ^{63}Cu, ^{64}Zn, ^{69}Ga, ^{88}Sr, ^{90}Zr, ^{93}Nb, ^{98}Mo, ^{114}Cd, ^{181}Ta, ^{137}Ba, ^{205}Tl and ^{208}Pb were analyzed in both methods. Sample digestion was performed in closed microwave Teflon vessel using nitric acid and hydrogen peroxide. The semi-quantitative analyses were performed using Rh as an internal standard and a solution containing Be, Ge, In and Re was used to calibrate the instrument. Accuracy studies for CRM samples, using the semi-quantitative mode analyses, evidenced that all the elements considered were within the certified range except for Cu and Pb that gave higher values than both certified values and quantitative mode analysis. In order to verify the applicability of the semi-quantitative method to