

# Chromium Species in Coal Water and Impacts for Health Human

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## Introduction

The zone in stud (South Santa Catarina) are associated with the Paraná Basin, consisting mainly of amphibolic rocks with large mineralizations of Fe, Zn, Pb sulphides, etc. Mining's Lauro Muller has left a large area covered by spoil heaps of stony material (with or without fine earth).

In the present study exposure to concentrations of chromium in coal mining zone of Santa Catarina, especially  $\text{Cr}^{6+}$ , because can have serious adverse health effects (ATSDR, 2003). Hexavalent chromium is not common in coal but can be found in the fly ash produced by oxidation during coal burning (Hwang and Wang, 2003).

Based on the partitioning between coal and fly and bottom ashes the chromium is low volatile elements with no partitioning between fly and bottom ashes (Pires and Querol, 2004).

## Materials and Methods

Samples of surface waters were taken at 23 points, comprising spoil heap runoffs and river waters. Briefly, water samples were acidified with nitric acid and treated in closed Teflon containers in a microwave oven to obtained total metal analysis CONAMA (1992) and/or solutions were filtered through a  $0.45\mu\text{m}$  filter Millipore and analyzed for pH; conductance; sulfates; Si (colorimetry of the blue siliconmo-lybdc complex);total chromium (atomic absorption spectroscopy)  $\text{Cr}^{6+}$  (UV-Visible Spectrophotometer). All the analyses were performed within a period of 72 hr after taking the river water samples. During this time the samples were kept refrigerated at  $3^\circ\text{C}$  in completely filled flash to prevent oxidation processes.

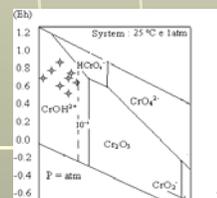
## Results and Discussion

The Brazilian coal samples generally have low total Cr contents than U.S., Australia, Turkish, Spanish and Canada.

The maximum value of total Cr detected in acid drain and contaminated coal river water is  $12\mu\text{g/L}$ . The average concentration of Cr in waters of Brazilian coal is  $6\mu\text{g/L}$ .

The Eh-pH diagram for chromium species in area studied is show in Fig 1. Much this diagram in occupied by insoluble  $\text{Cr}_2\text{O}_3$ . This species dissolves to form  $\text{CrOH}^{2+}$  slightly below  $\text{pH}=5$  and to form  $\text{CrO}_2^-$  above  $\text{pH} 13.5$ . Cr(III) oxidizes to form Cr(VI) as  $\text{HCrO}_4^-$  and  $\text{CrO}_4^{2-}$  ions at high Eh. Cr(VI) species are known carcinogens, and it is noted that both  $\text{HCrO}_4^-$  and  $\text{CrO}_4^{2-}$  occupy fairly large Eh-pH fields.

Figure 1: Chromium species in area studied.



## Conclusion

As coal mining expose rock rich in iron sulfide to oxygen and water the resulting acid drainage endangers aquatic ecosystems, in some cases for centuries. The medium value of total Cr detected in acid drain and contaminated river water is between  $6-12\mu\text{g/L}$ . Persons living in the vicinity of such coal mineration facilities or uncontrolled waste sites may also be exposed via water contamination.

## Acknowledgements

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## References

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