

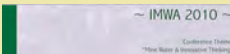





Possibility of removing metals from acid mine drainage using industry waste processing agates as adsorbent

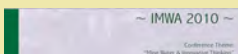

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SUMMARY

- Introduction
- Objective of the study
- Production and laboratory test of adsorbent made from microcrystalline silica residue
- Results
- Conclusions

Introduction

- Brazil is a leading producer of color gem
- Rio Grande do Sul state – highest producer of agates and amethysts
- Gems beneficiation - generates 35% of residues

• **Aim of this work:** develop a commercial adsorbent from microcrystalline silica



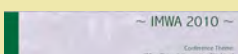


Location







Fonte: PMSJ, 2009

MATERIAL AND METHODS

Test stages:

- Sample collected
- Characterization and preparation of the adsorption material to be used
- Thermal treatment of microcrystalline silica to improve pore area
- Methylene blue tests
- AMD removal metals tests




TESTS AND RESULTS

Sample collected- According to NBR 10007 –Sampling of solid waste (ABNT, 2004)

The microcrystalline silica collected was from white agate, which is used to make colored gems.




TESTS AND RESULTS

Granulometry- Analysys according to NBR 6502 and grinding.

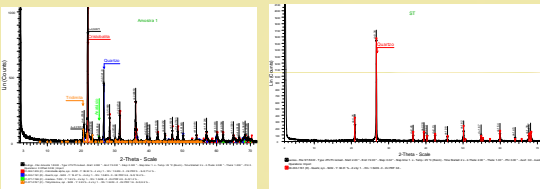
X-Ray Fluorescence

Composition	Results
SiO ₂	98,94%
Fe ₂ O ₃	0,64%
Al ₂ O ₃	0,19%
CaO	0,08%
SO ₃	0,06%
K ₂ O	0,04%
TiO ₂	0,04%

Over 98% is composed by microcrystalline silica.

X-Ray Diffraction

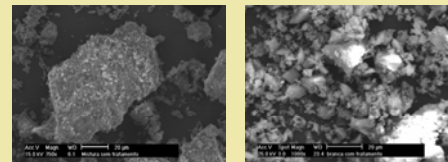
Silica oxide is divided in three different crystalline phases: cristobalite, tridymite and quartz.



Before thermal treatment

After thermal treatment

Scanning Electron Microscopy

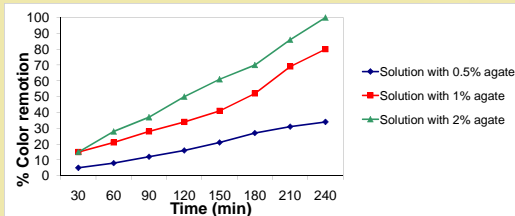


Before treatment

After treatment

It can be observed the silica microcrystalline structure changed.

Methylene blue tests



Silica was calcinated at 700°C in one hour time.

Removal of dissolved metals present in the AMD

- The results were satisfactory using 2% microcrystalline silica in solution of AMD:

Metals	Before (%)	After (%)	% Removal
Fe	4.85	1.58	67.43
Al	0.15	0.00	100.00
Cu	0.11	0.04	63.81

It was proved then that the ideal reaction removal time is 4 hours. This time was ideal because after that, the remotion rate was not significant.

CONCLUSIONS

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- The tendency of the full use of waste is an increasing need due to serious environmental problems that have occurred worldwide.
- The residue of agate stones used as microcrystalline silica studied demonstrates a technological potential as raw material for producing an adsorbent which can be used for various purposes.

CONCLUSIONS

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- The tests showed the potential use of this waste, after thermal treatment, removing the metals present in the AMD.
- It was shown in this study that the optimum reaction time is 4 hours and a concentration of 2% for significant removal of metals such as iron, aluminum and copper.
- Further tests are being carried out following this study, aiming to confirm these data and their use in industrial scale. For that, intending to micronize the silica, diminishing its particle size, increasing its superficial area, improving its adsorbent properties.



ACKNOWLEDGMENTS

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Brazilian Coal Research Network









Thanks for the attention

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