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MODELLING THE FUTURE

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NanoCatRed project
Pilot-plant studies on bromate reduction from water

NANOTECHNOLOGIES

Anabela Nogueira[a], Mariana Silva[a], O. Salomé G. P. Soares[b], Carla A. Orge[b], Juliana Sousa[c], Sérgio Castro-Silva[a]

[a] Adventech – Advanced Environmental Technologies, Rua dos Fundões, 151 3700-121 São João da Madeira, Portugal
[b] Laboratory of Separation and Reaction Engineering – Laboratory of Catalysis and Materials (LSRE-LCM), Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias. 4200-465 Porto, Portugal
[c] INL - International Iberian Nanotechnology Laboratory, Avenida Mestre José Veiga s/n, 4715-330 Braga, Portugal

INTRODUCTION

Catalytic hydrogenation is a promising technology for the removal of oxygen-containing anionic contaminants (oxyanions) such as bromate, nitrate, and perchlorate, from water, without the generation of concentrated secondary waste streams. Conventional water treatment technologies are not efficient in the removal of these pollutants. However, advanced technologies such as ionic exchange, reverse osmosis are effective in their removal, but result in highly concentrated secondary waste streams. The NanoCatRed project aimed to tuning of the metallic nanoparticles and nanostructured support properties to produce highly active, selective, and stable catalysts for the removal of oxyanions from water through long term experiments in a laboratorial pilot unit developed under this project.

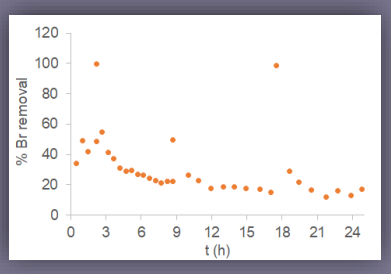
RESULTS

The catalytic hydrogenation pilot plant built (Picture 1) was tested using drinking water. Six different catalysts were produced and tested in the pilot for bromate reduction. Tests were performed for up to 500 min in continuous mode, using 45 L/h of water and 30 dm3/min to 95 dm3/min of hydrogen, being initial bromate concentration of 300 ppb.
Picture 2 and Picture 3 show that bromate removal is higher using catalysts in powder form when compared to pellets. PDCU/CXR1 catalyst reached almost 100% removal after 1 h of reaction when in powder, while in pellets only achieved 15%, at steady state.
Long term tests were performed (Picture 4) using 45 dm3/min hydrogen inlet. Initially, high performance for bromate reduction (49%) was reached, observing a slight deactivation afterwards, reaching 20% at steady state.

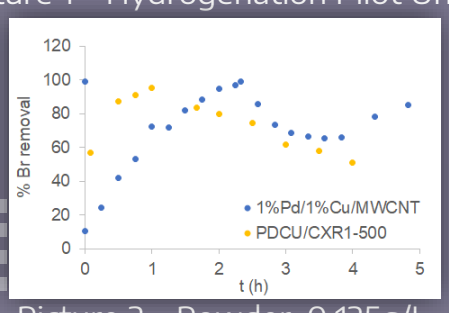
CONCLUSIONS

- PDCU/CXR1-500 in pellets showed promising results when tested at continuous mode reactor for bromate reduction in drinking water.
- New developments must be made to use this catalyst in a post-treatment wastewater whose results showed almost no conversion (results not presented).

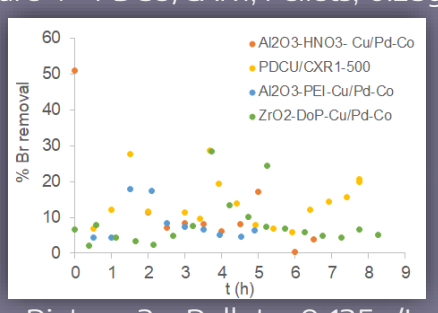
Picture 1 – Hydrogenation Pilot Unit



Picture 4 – PDCU/CXR1, Pellets, 0.28g/L



Picture 2 – Powder, 0.125g/L



Picture 3 – Pellets, 0.125g/L

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