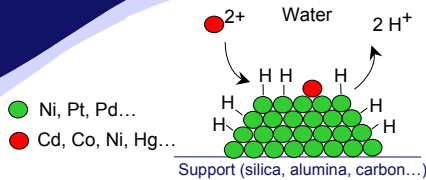


Removal of Traces of Cadmium Ions from Water by Adsorption on Ni Particles Studied "in situ" by XAS

A. de Mallmann, G. Godard, S. Fiddy, J.-P. Candy, J.-M. Basset
 Laboratoire de Chimie Organo-Métallique de Surface
 43 bd du 11 Novembre 1918, F-69616 Villeurbanne (France)



The metallic ions are reduced by adsorbed hydrogen and strongly anchored on the surface of the nickel particles.

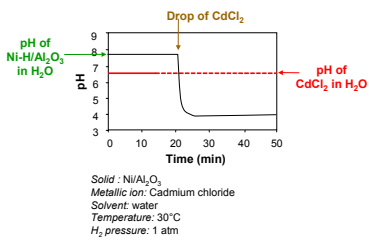
One surface nickel atom can graft one cadmium ion.

The nature of the interaction between Cd and Ni surface atoms is investigated by in situ XAS

Adsorbent: Ni particles supported on alumina (200 m²/g) - 59 wt% Ni - particle size: 50-100 Å (magnetism) - Ni Dispersion = 8 % (H₂ chemisorption)

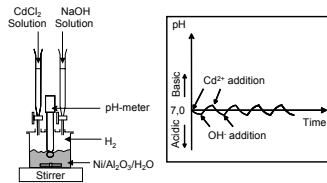
Evidence for H⁺ Formation

Acidification of the reaction medium during cadmium addition to Ni-H surface

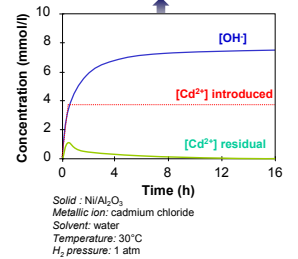
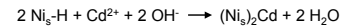
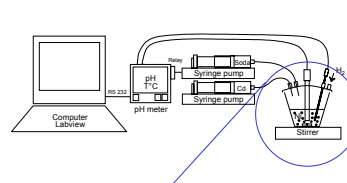


pH Regulation and Produced H₃O⁺ Titration

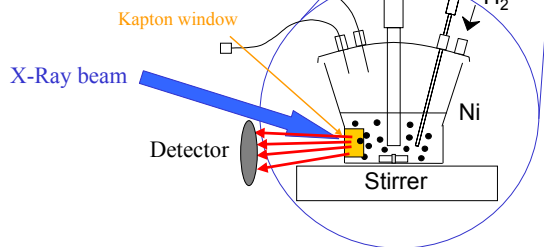
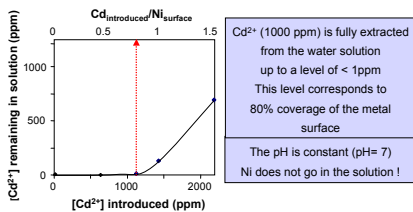
Neutralization of the produced hydronium ions
 H₃O⁺ + OH⁻ → 2 H₂O



Automatic pH regulation and H₃O⁺ titration

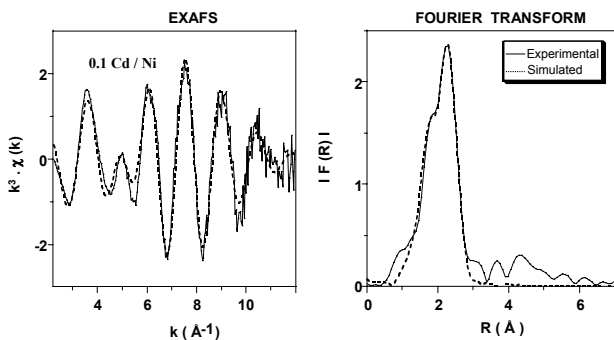


Cadmium Removal



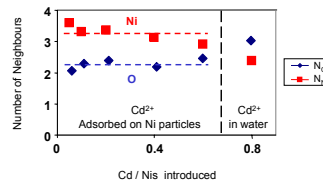
EXAFS Study (Cadmium K-edge)

EXAFS spectra were recorded in situ, in water, by fluorescence on ID26 at the Cd K edge (26711 eV – Si(220), 5th harmonic) with the qscan mode (26580 to 27710 eV in 15 sec)

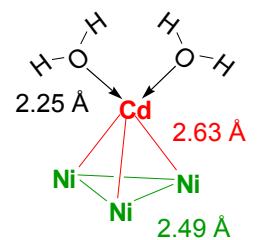


Cd _{grafted} / Ni _s	Neighbour	Number of Neighbors	Distance to Cd (Å)
0.05 - 0.6	Ni	3.0 - 4.0	2.61 - 2.64
	O	2.0 - 2.5	2.24 - 2.26

Cadmium is bonded onto the nickel surface

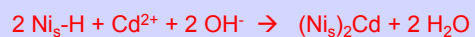


Proposed Model



Acknowledgments

Armida Sodo, Laurent Alvarez, Olga Safonova, Sigrid Eeckhout and Thomas Neisus (ID26 at ESRF – Project ME 600)



Mechanism Proposed for Cadmium Adsorption

