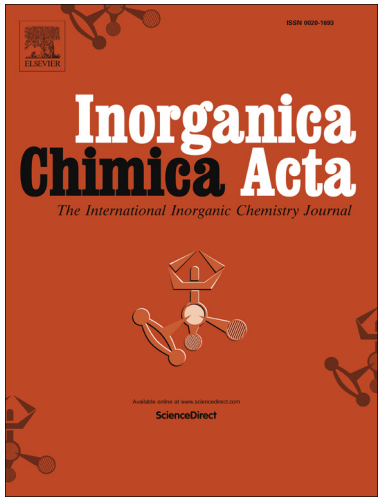

Monitoring Cobalt Ions Siting in BEA and FER Zeolites by *in-situ* UV-Visible spectroscopy: A DRS study

S. Castilho, A. Borrego, C. Henriques, M.F. Ribeiro, A. Fernandes

PII: S0020-1693(16)30289-4
DOI: http://dx.doi.org/10.1016/j.ica.2016.05.047
Reference: ICA 17083

To appear in: *Inorganica Chimica Acta*

Received Date: 14 March 2016
Revised Date: 18 May 2016
Accepted Date: 19 May 2016

Please cite this article as: S. Castilho, A. Borrego, C. Henriques, M.F. Ribeiro, A. Fernandes, Monitoring Cobalt Ions Siting in BEA and FER Zeolites by *in-situ* UV-Visible spectroscopy: A DRS study, *Inorganica Chimica Acta* (2016), doi: http://dx.doi.org/10.1016/j.ica.2016.05.047

Monitoring Cobalt Ions Siting in BEA and FER Zeolites by *in-situ* UV-Visible spectroscopy: a DRS study.

S. Castilho, A. Borrego, C. Henriques, M. F. Ribeiro, A. Fernandes[a*].

CQE, Centro de Química Estrutural, Instituto Superior Técnico, University of Lisbon, Av. Rovisco Pais, 1049-001 Lisboa, Portugal
**Corresponding author, auguste.fernandes@ist.utl.pt*

A B S T R A C T

Two series of cobalt exchanged BEA and FER zeolites were obtained by using two distinct preparation methods to introduce the metal through ion-exchange, the conventional method and a microwave (MW)-assisted method. The different Co-based zeolites were characterized by the means of spectroscopic UV-Visible technique and chemical analyses and compared in terms of efficiency in cobalt introduction and cobalt siting within the pores of BEA and FER structure. A first concluding result relates with the implementation of a quantitative Co UV-Vis analysis, a simple method that can easily substitute time consuming and expensive chemical analyses. From the analysis of DRS UV-Vis spectra obtained for materials with cobalt contents from 0.01 to 3 wt.%, and assuming different Al framework distributions, it was possible to identify the siting of Co cations or the occurrence of oxidic Co species. For both zeolites, conventional and microwave-assisted ion exchange led to similar Co distributions over sites α, β and γ, although in the latter case the final amount of Co is substantially lower. Moreover, microwave radiation seems to be an interesting tool to prepare metal-based zeolites with interesting catalytic oxo-cations and/or cobalt oxide.

Keywords: Cobalt, BEA, FER, Microwave, ion-exchange, in-situ DRS spectroscopy.

1. INTRODUCTION

Metals incorporated into microporous (zeolites, aluminophosphates, etc.) and mesoporous molecular sieves, either directly within the framework (during hydrothermal synthesis) or introduced by post-synthesis methods (ion-exchange, impregnation, solid-state reaction, etc.) have been widely investigated over the last two decades for their promising catalytic properties [1-6]. In particular, metal-based zeolites