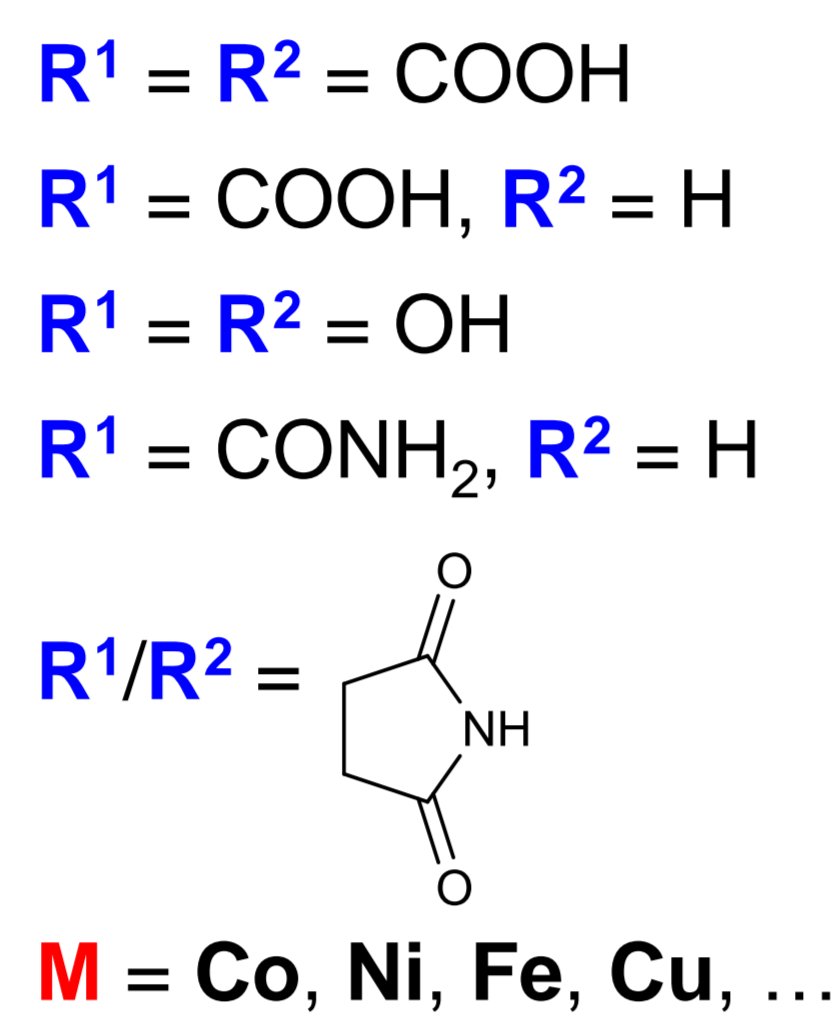
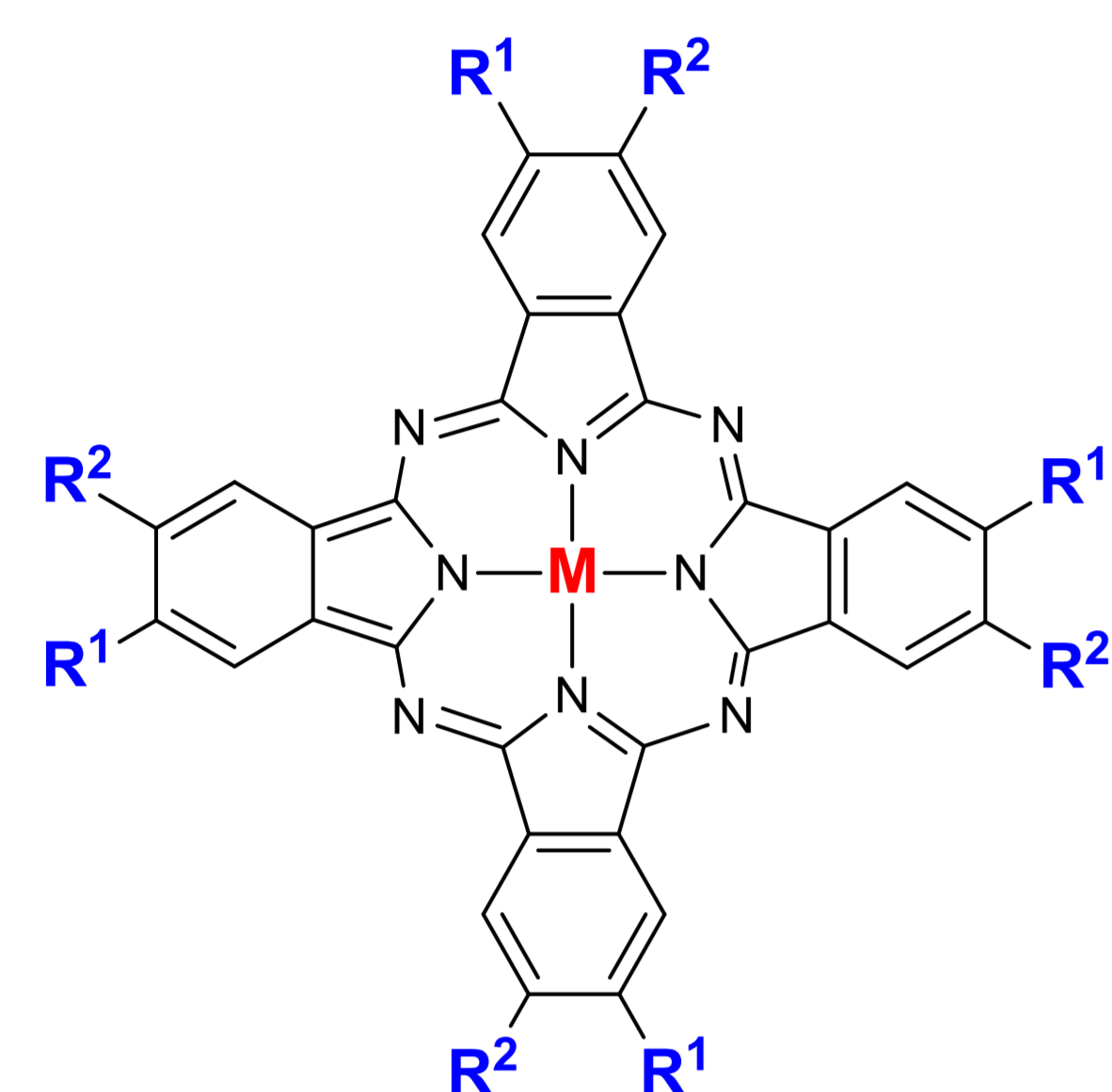


Introduction

Since the early 20th century phthalocyanines and their appropriate metal complexes have attracted much attention due to their distinct aromaticity and planar structure. Exhibiting a high chemical and thermal stability, interesting electronic, spectroscopic as well as optical properties, during the last two decades phthalocyanines have gained special interest in the field of material science as they find application in non-linear optics, in optical data storage, as electrochromic substances, gas sensors, in photochemical and photovoltaic cells or in the therapy of cancer.^[1,2]

Motivation



One of the challenges of project SP2 is to synthesize magneto-active molecules, which have the possibility to generate networks formed by hydrogen bond interactions, when deposited on surfaces (e.g. Au(111)). This can be achieved by terminal modification of the phthalocyanine scaffold, using polar substituents, which provides hydrogen donor and/or acceptor functionalities.

Here we report on the synthesis and characterization of various tetra- and octa-substituted phthalocyanines ($R = \text{COOH}, \text{OH}, \text{CONH}_2$, etc.) and the appropriate metal species (Co, Ni, Fe, Lu and Sm) and their use for magnetic response. In cooperation with SP6 the arrangement of phthalocyanine monolayers based on the intermolecular hydrogen bond interactions should be determined *via* STM (scanning tunneling microscopy) (Fig. 1).

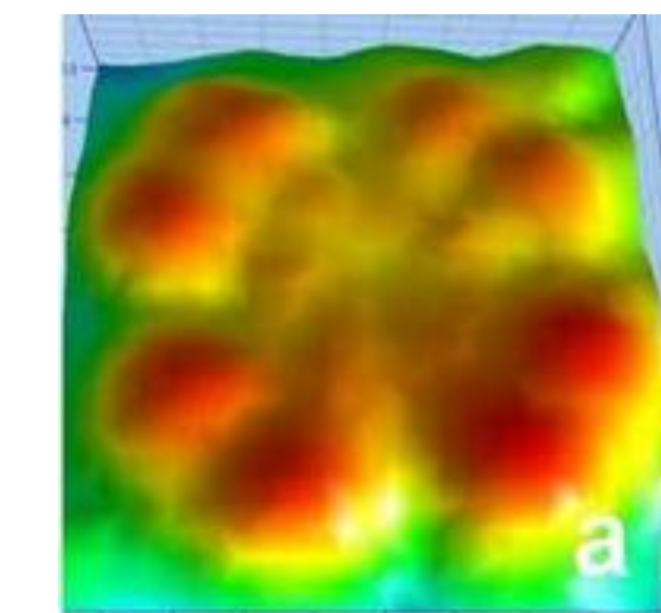


Fig. 1: STM-image of LuPc₂.

Synthesis

The metal phthalocyanines are accessible in a one step cyclotetramerisation reaction of functionalized phthalic anhydrides and benzodinitriles, respectively, with the corresponding metal salts in high boiling solvents or melts.^[3] After appropriate work-up, the thus obtained compounds were fully characterized by high resolution and solid-state ¹H and ¹³C{¹H} NMR, IR and UV/Vis spectroscopy, elemental analysis as well as mass spectrometry.

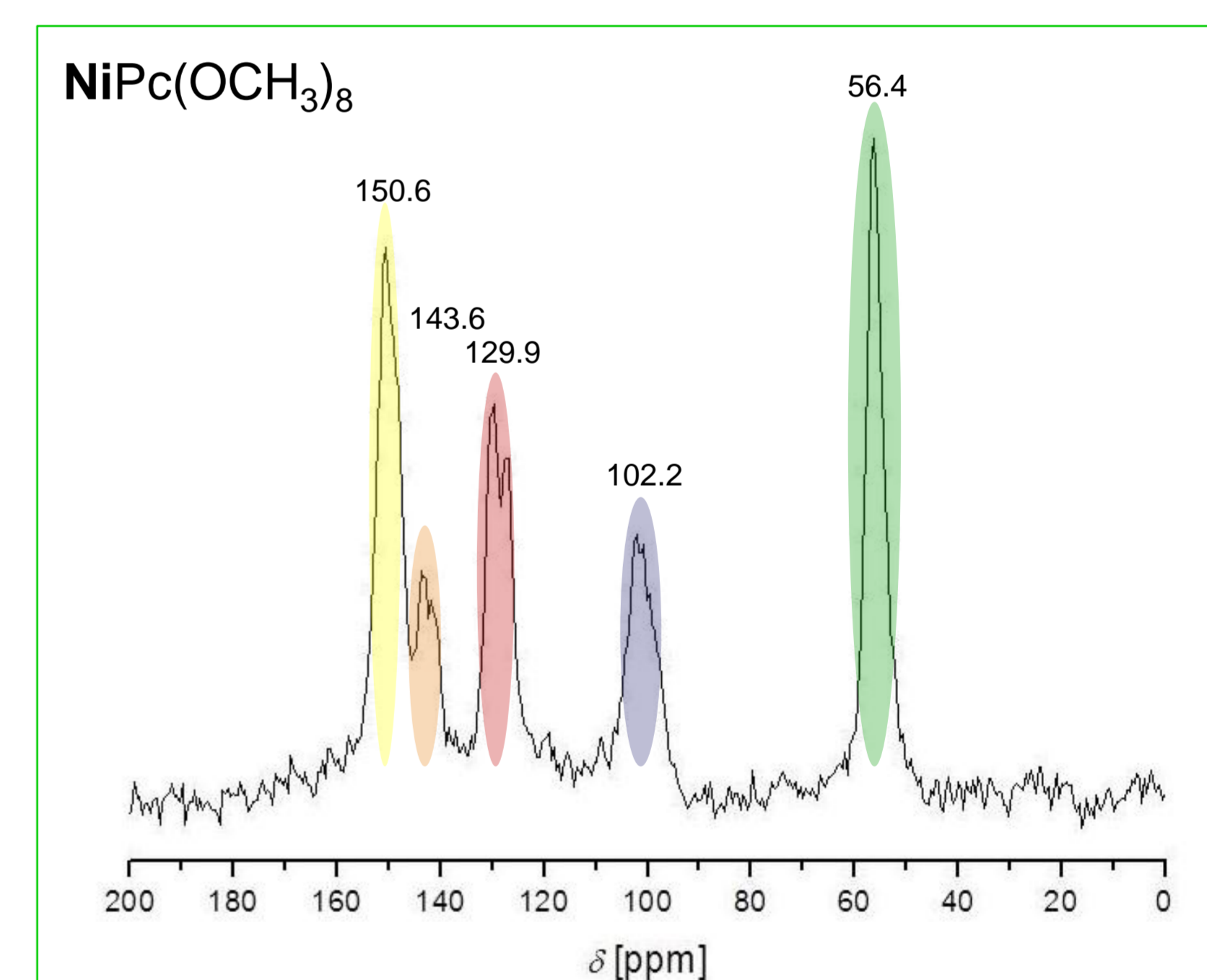
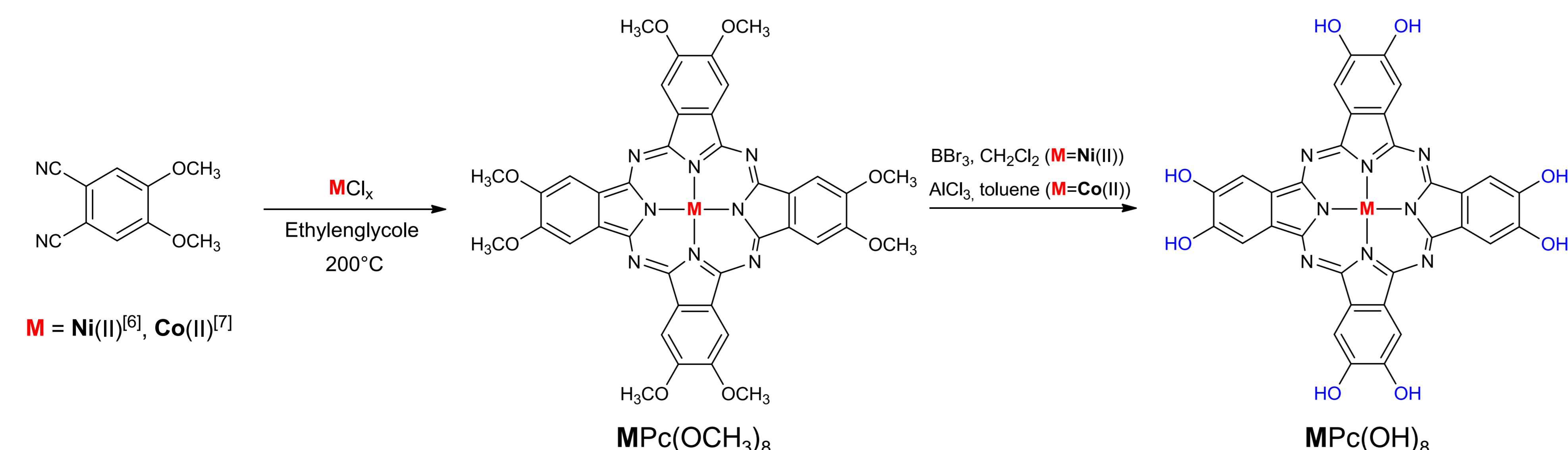
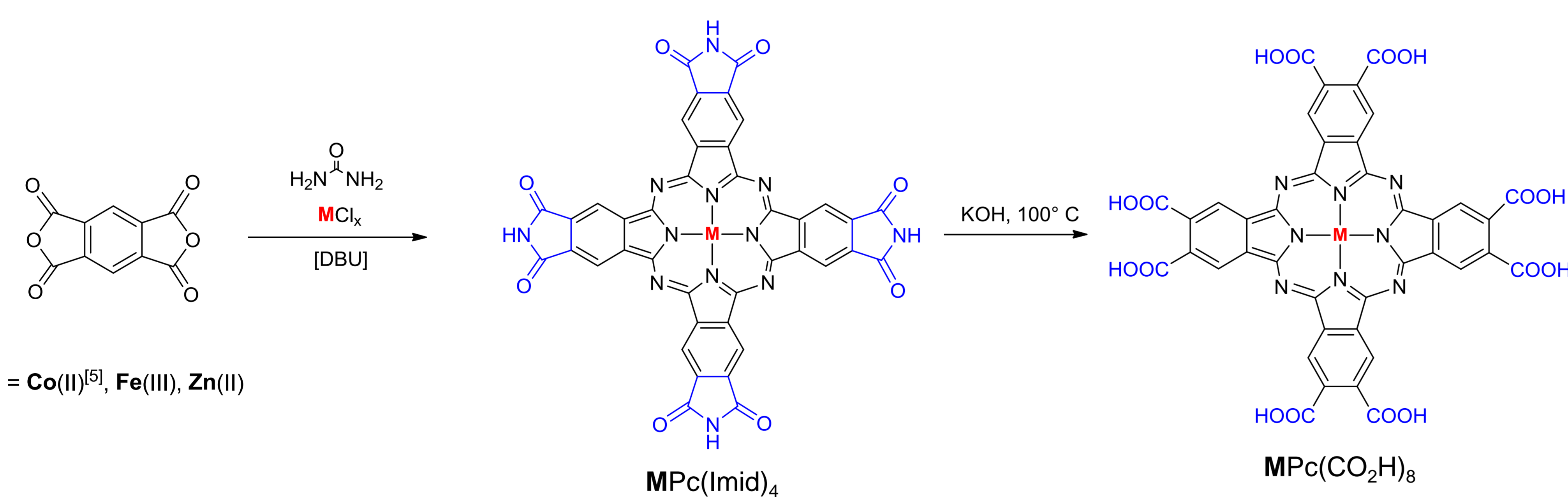
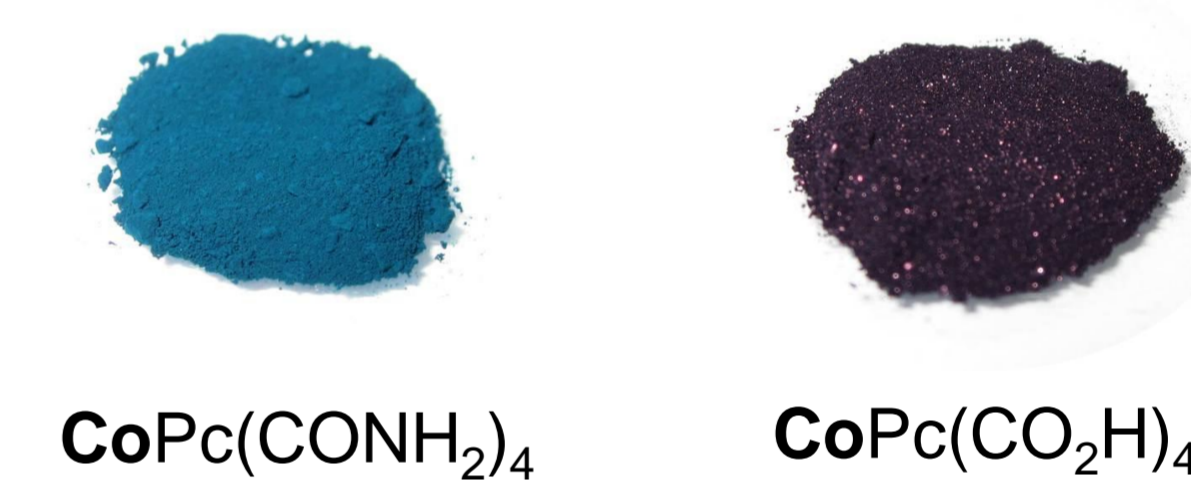
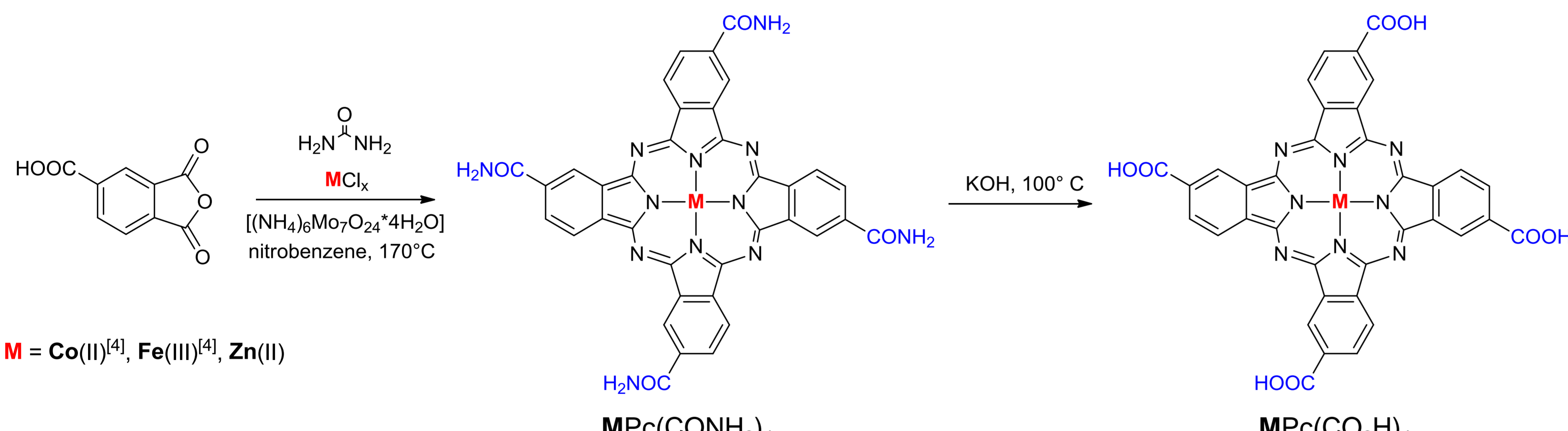


Fig. 2: Solid-state ¹³C{¹H} NMR spectrum of NiPc(OCH₃)₈.



References and Acknowledgment

[1] M. Hanack, *Tr. J. of Chemistry*, **1998**, 22, 13–22. [2] F. Yuksel, S. Tuncel, V. Ahsen, *J. Porphyrins Phthalocyanines*, **2008**, 12, 123–130. [3] M. Hanack, M. Lang, *Adv. Mater.* **1994**, 6, 819–833. [4] H. Shirai, A. Maruyama, K. Kobayashi, N. Hojo, K. Urushido, *Makromol. Chem.*, **1980**, 181, 575–584. [5] K. Sakamoto, E. Ohno, *Prog. Org. Coat.*, **1997**, 31, 139–145. [6] M. Ruf, M. Lawrence, B. C. Noll, C. G. Pierpont, *Inorg. Chem.*, **1998**, 37, 1992–1999. [7] a) J. Metz, O. Schneider, M. Hanack, *Inorg. Chem.*, **1984**, 23, 1065–1071. b) J. F. van der Pol, E. Neeleman, J. C. van Miltenburg, J. W. Zwikker, R. J. M. Nolte, W. Drenth, *Macromolecules*, **1990**, 23, 155–162.