

# SOLID-STATE NMR ANALYSIS OF PHARMACEUTICAL PRODUCTS CONTAINING EQUISETUM ARVENSE AND URTICA DIOICA L.

Paulina Nykiel, Lukasz Pajchel, and Wacław Kołodziejcki

*Medical University of Warsaw, Department of Inorganic and Analytical Chemistry, ul. Banacha 1, 02-091 Warsaw, Poland*

In Polish traditional medicine, medical plants are of significant importance in primary healthcare. *Equisetum arvense* and *Urtica dioica L.* are natural sources of assimilable silicon forms. Drugs containing those herbs are used for the treatment of silicon deficiency in humans and furthermore to cure many skin problems and diseases, e.g. hair loss caused by osteoporosis.

Silicon is the second most abundant element on Earth after oxygen. It makes up 25 wt% of the Earth's crust. Nevertheless, most of silicon compounds are not assimilated by plants and animals. Silicon present in plants comes from an uptake of its scantily soluble forms:  $\text{Si(OH)}_4$  or  $\text{Si(OH)}_3\text{O}^-$  [1].

We are interested in the silicon speciation in the *Equisetum arvense* herb, in leaves of *Urtica dioica L.* and in medical products containing silicon. The study is carried on using  $^{29}\text{Si}$  MAS NMR with and without cross-polarization from protons. Our preliminary results show that in the studied plant material there are four silicon forms assigned according to Ref. [2]:  $\text{Si(OH)}_3(\text{OSi})$ ,  $\text{Si(OH)}_2(\text{OSi})_2$ ,  $\text{Si(OH)(OSi)}_3$  and  $\text{Si(OH)}_4$ .

For the semiquantitative analysis, the collected spectra were deconvoluted into signals of various silica forms.

The project is to be continued with other pharmaceutical products.

## References:

1. H. Currie, C. Perry. Silica in Plants: Biological, Biochemical and Chemical Studies. *Animals Annals of Botany*, 1-7 (2007).
2. J. Park, K. Kim, T. Park, E. Park, Y. Kim. Solid-state NMR Spectroscopy of Silicon-treated Rice with Enhanced Host Resistance against Blast. *Analytical Sciences* Vol.22, 645-648 (2006).