# Organosilanes and nanoporous Si via an HF-free electrochemical dissolution of silicon

Arturo Zizumbo[1] and Viatcheslav Jouikov *[2]

[1] *Technological Institute of Tijuana, 22414 Tijuana, BC, Mexico*

[2] *UMR 6226 ISCR, University of Rennes 1, 35042 Rennes, France. E-mail: vjouikov@univ-rennes1.fr*

Electrochemical activation of silicon allows boosting its electrophilicity, which has a large promise for at least two useful applications at the same time.

i) Nanoporous Si is usually obtained via oxidation of Si samples in HF solutions [1]. We shall present a process for electrochemical etching of silicon materials of various degrees of purity (with Si content ranging from 67% to 99.999999%) – *using neither HF nor strong bases*, - which leads to the formation of meso- and nano-porous silicon layers at the surface of bulky Si samples (Figure 1). Concomitantly, the process enables an unprecedented purification of Si from 67% to 99.99% in one single step [2].

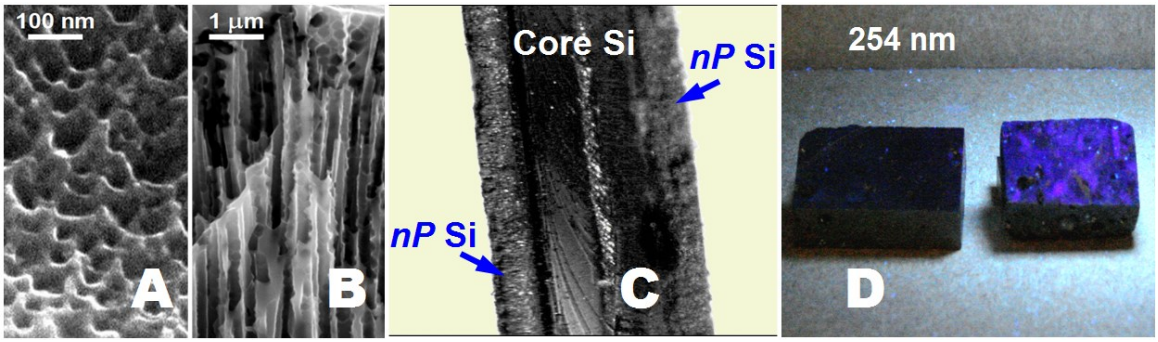


**Figure 1.** SEM of porous Si obtained via the HF-free process from: (A) 67% metallurgical Si alloy, (B, C) 9N purity Si wafer. (D) 67% Si alloy before (left) and after (right) HF-free etching under 254 nm UV irradiation**.**

ii) When the process is carried out in the presence of *in situ* electrogenerated C-nucleophiles, silicon sacrificial anode can act as a source of Si for the direct electrosynthesis of organosilanes. The process occurs at atmospheric pressure and RT.

In both cases, the key element of the process is the use of specific electroactive N-heteroaromatic bases acting as non-innocent ligands [3] for electrophilic silicon. This process and the examples of preparation of Si materials will be illustrated by CV, EIS, EPR, SEM, EDS, and FTIR spectroscopy.

[1] M. J. Sailor, *Porous Silicon in Practice*, Wiley-VCH, Weinheim, **2012**.
[2] V. Jouikov, A. Zizumbo, *Eur. Pat*. 16305617.9, 27.05.**2016**.
[3] M. Dieng, J. Simonet, V. Jouikov, *Electrochem. Comm.* **2015**, *53*, 33.