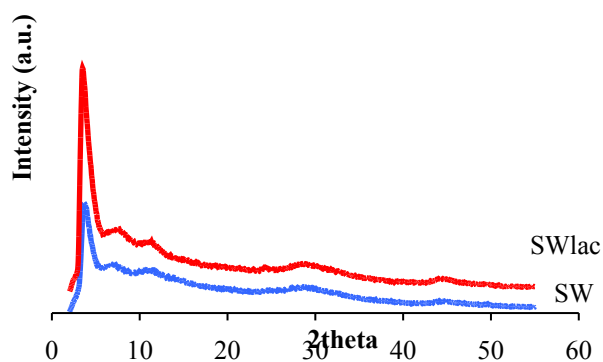


**Supporting information of**  
**Influence of structural defects of Ge-imogolite nanotubes on their**  
**toxicity towards *Pseudomonas brassicacearum*.**

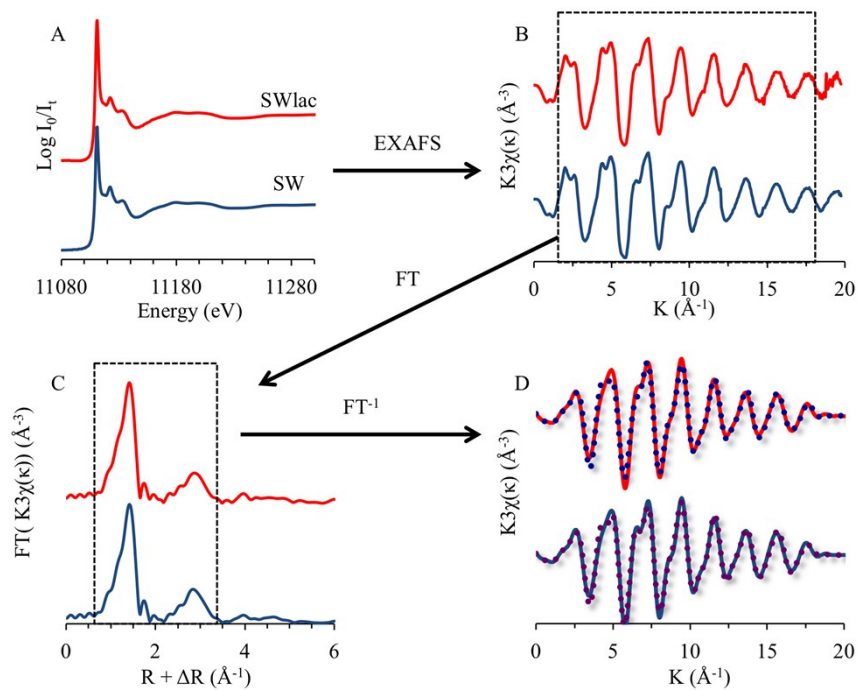
**A. Avellan, C. Levard, J. Rose, M. Auffan, M. Bertrand, L. Olivi, C.**  
**Santaella, W. Achouak and A. Masion**



**Figure S. 1 :X-ray diffraction patterns of Ge-imogolite well crystallized (SW) or with lacunar site in its structure (SWlac)**

SW are SWlac have specific Ge-imogolite single-walled XRD pattern.<sup>1</sup>

To finely characterize the presence of lacunar site in the aluminium octahedral layer, we processed EXAFS at Ge k-edge. EXAFS is an element specific probe of the atomic environment of a given atom (here Ge). The steps for EXAFS data extraction and treatment are presented in Figure S. 2. Normalized X-ray absorption spectra is used to extract EXAFS oscillations, which are Fourier transformed. Then a window is taken in the  $R+\Delta R$  region containing the information of interest, and is back-Fourier transformed.



**Figure S. 2: (A) Normalized X-ray absorption spectra (B) Extracted EXAFS spectra oscillations from (B). (C) Fourier transforms of data in the window ( $2 < k < 18 \text{ \AA}^{-1}$ ) of the EXAFS spectra. (D) Back-Fourier transform spectra of the peak ( $1.5 \text{ \AA} < R < 3.5 \text{ \AA}$ ). Experimental data (lines) and best fits (dotted lines).**

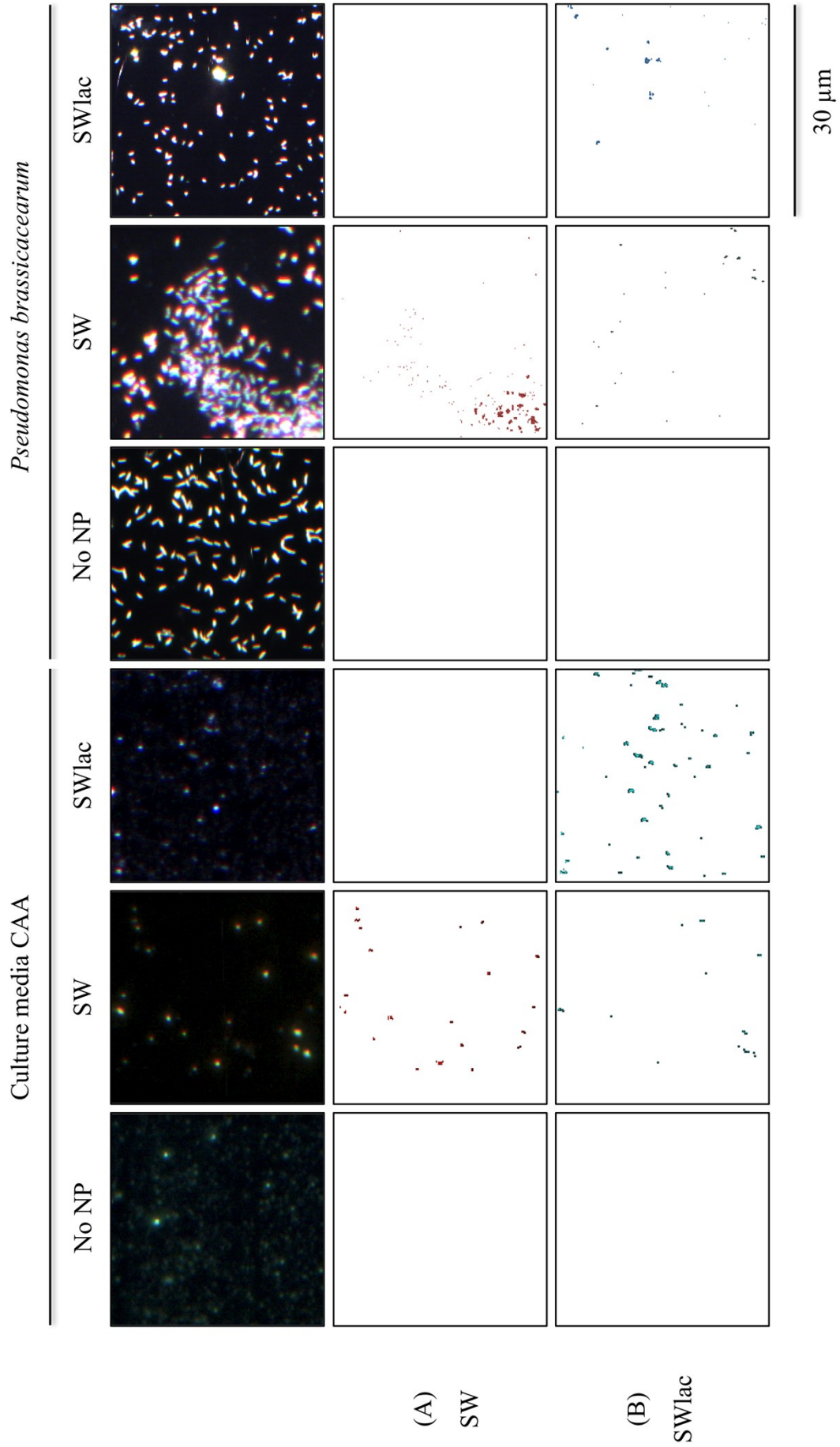


Figure S. 3 : Mapping results of hyperspectral libraries of (A) Single Walled (SW) or (B) SW lacunar (SWlac) on pictures of culture media (left) and bacteria (right) with or without 50mg.L<sup>-1</sup> of SW and SWlac. Mapping made using Spectral Angle Mapper (0,085 rad).

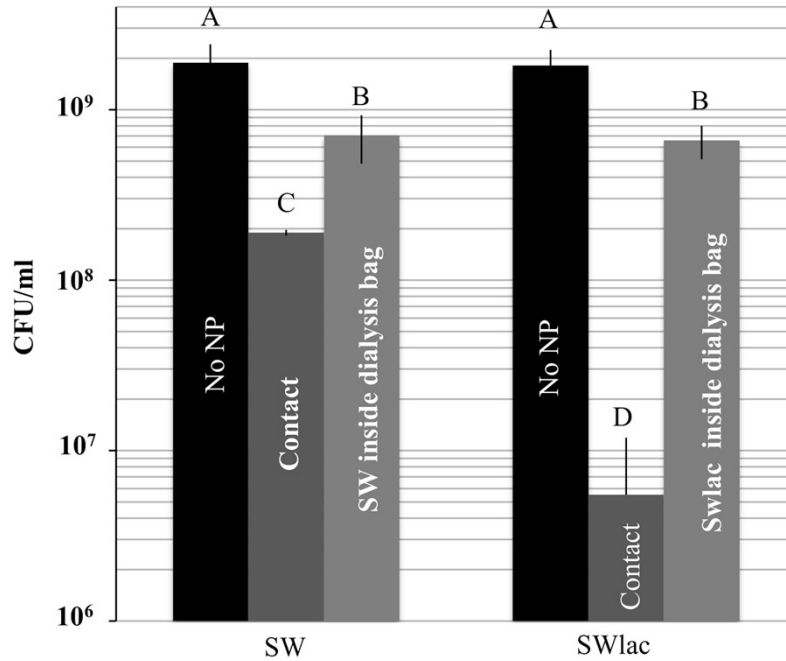


Figure S. 4 : : bacterial number per ml. *Pseudomonas brassicacearum* was exposed to 0 (no NP) or 50 mg/l of Ge-imogolite (SW or SWlac) during 24h in CAA media. Bacteria and NM were directly in contact, or by placed in dialysis bag. Groups marked by letters are statistically different from each other (ANOVA, Turkey HSD test,  $p < 0.05$ ).

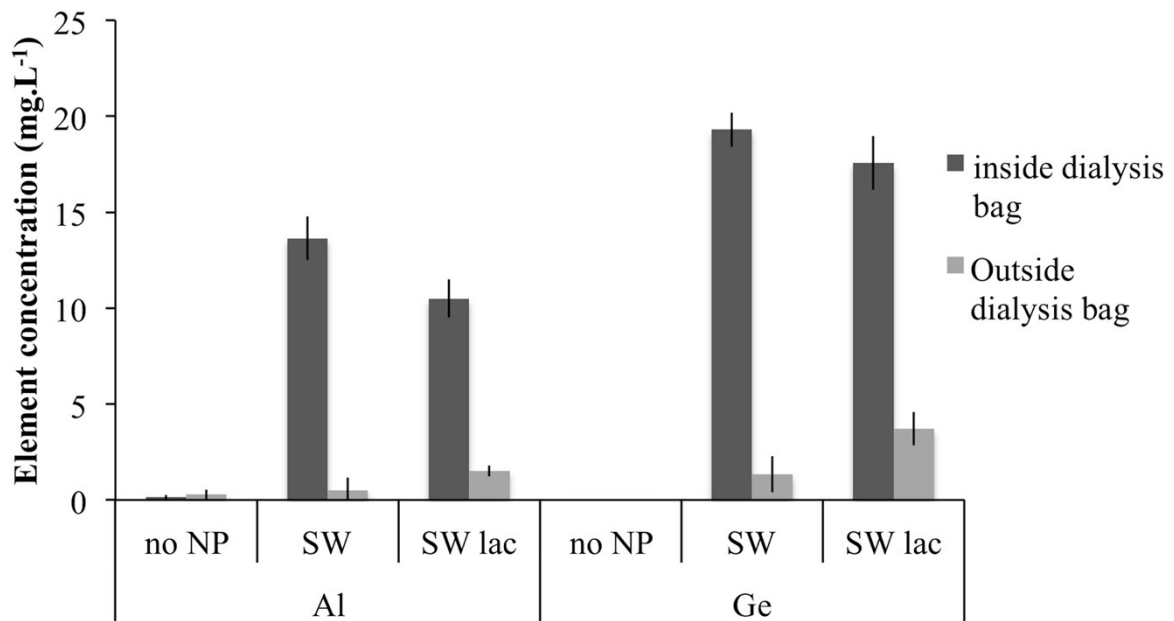


Figure S. 5: SW or SWlac element concentration in abiotic CAA media after 24h at 28°C and 150rpm agitation. Ge-imogolite were kept inside a dialysis bag and element concentrations were measured inside and outside the dialysis bag. Element passing the dialysis bag pores (10kDa) were assumed to be dissolved ions.