

Raman Micro-spectroscopy and Multivariate Statistics to Study the Influence of Silica on Germinating Pollen Grains

Maike Joester^{1,2}, Stephan Seifert^{1,2}, Franziska Emmerling² Janina Kneipp^{1,2}

¹Department of Chemistry, Humboldt Universität zu Berlin, Germany

²Federal Institute for Materials Research and Testing, Berlin, Germany
maike.joester@chemie.hu-berlin.de

For plants, silica is available from dust or soil, and in most plants it can be found in equivalent amounts as calcium or magnesium. [1] Until today, silica is known not to be essential for plants albeit many studies report about its effects, such as an enhancement of plant fitness and increased yields of crops. However, plants can only absorb the acid form of silicon dioxide and not the crystalline form. To understand possible effects of silica on plants, we analysed pollen grains as a model system for plant material due to their fast growth of new cells in the pollen tube and the easily adjustable germination conditions.

In our poster we present the results of Raman experiments with three different species of pollen grains (*Pinus nigra*, *Picea omorika* and *Camellia japonica*), which germinated in nutrient media containing silica and in a reference medium. We will show the results of hierarchical cluster analyses and principal component analyses executed on the data and discuss the biochemical changes that occur during germination at high silica concentration. Thereby, we extend the information of previous data on general pollen physiology [2, 3] and show that a differentiation between pollen species, their histological characteristics, and germination conditions is possible.

Acknowledgements

Financial support from ERC Grant No. 259432 (J.K.) and Einstein Stiftung Berlin (M.J., F.E., J.K.) is gratefully acknowledged.

References

- [1] E. Epstein. Silicon. *Annual Review of Plant Physiology and Plant Molecular Biology* 50, 641-664 (1999).
- [2] F. Schulte, U. Panne, and J. Kneipp. Molecular changes during pollen germination can be monitored by Raman microspectroscopy. *Journal of Biophotonics* 3(8-9), 542-547 (2010).
- [3] F. Schulte, et al.. Chemical Characterization and Classification of Pollen. *Analytical Chemistry* 80(24), 9551-9556 (2008).