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Application of SERS Nanoparticles to Intracellular pH Measurements TED LAURENCE, CHAD TALLEY, Lawrence Livermore National Laboratory, MICHAEL COLVIN, University of California, Merced, THOMAS HUSER, Lawrence Livermore National Laboratory — We present an alternative approach to optical probes that will ultimately allow us to measure chemical concentrations in microenvironments within cells and tissues. This approach is based on monitoring the surface-enhanced Raman scattering (SERS) response of functionalized metal nanoparticles (50-100 nm in diameter). SERS allows for the sensitive detection of changes in the state of chemical groups attached to individual nanoparticles and small clusters. Here, we present the development of a nanoscale pH meter. The pH response of these nanoprobes is tested in a cell-free medium, measuring the pH of the solution immediately surrounding the nanoparticles. Heterogeneities in the SERS signal, which can result from the formation of small nanoparticle clusters, are characterized using SERS correlation spectroscopy and single particle/cluster SERS spectroscopy. The response of the nanoscale pH meters is tested under a wide range of conditions to approach the complex environment encountered inside living cells and to optimize probe performance. This work was performed under the auspices of the U. S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

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