

#### 4.1.8 NANOARRAYS OF SINGLE VIRUS PARTICLES

R. A. Vega, D. Maspoch, K. Salaita, C.A., Mirkin, "Nanoarrays of Single Virus Particles," *Angew. Chem. Int. Ed.*, **2005**, *44*, 6013–6015.

To understand the way that viruses and cells move and grow, strategies must be developed to arrange these biological entities on a surface. NU-NSEC researchers have developed a novel strategy that utilizes a combination of Dip-Pen Nanolithography (DPN) and coordination chemistry to immobilize and position individual virus particles in large arrays.

For these studies Tobacco Mosaic Virus (TMV) was chosen as the model system due to its anisotropic tubular structure (~300 nm long, 18 nm diameter), its size, stability, and well-characterized carboxylate-rich surface. The approach relied on metal ions ( $\text{Zn}^{2+}$ ) that connected the carboxylate-rich surface of TMV to DPN-generated 16-mercaptohexadecanoic acid (MHA) features. Virus nanoarrays were fabricated from DPN-generated MHA templates, and the regions surrounding these features passivated with 11-mercaptoundecyl-penta(ethyleneglycol) (PEG-SH) to reduce nonspecific binding of the virus particles to the unpatterned areas. The carboxylic acid groups of MHA were then coordinated to  $\text{Zn}^{2+}$  ions, and the metallated substrate exposed to a TMV solution. These virus nanoarrays were then characterized by tapping-mode AFM (TMAFM), and the chemical identity of the surface-immobilized virus particles confirmed with highly specific anti-TMV antibody.

This technology will yield larger and denser libraries for screening complex chemical and biological systems, and provide the investigator with the potential to isolate nano- and microscale biological entities (proteins, viruses, and cells) at the single-particle level.

