

Title: Sol-gel electrophoresis for the formation of nanosized nanostructured materials

Type: Student

Awardee: Steven Limmer

Mentors: Guozhong Cao – UW; Timothy L. Hubler – PNNL

Description: We have demonstrated a new technique for the formation of oxide nanorods using sol-gel electrophoresis.  $\text{Pb}(\text{Zr,Ti})\text{O}_3$  nanorods with a diameter of 70-150 nm and a length of 10  $\mu\text{m}$ , as well as  $\text{BaTiO}_3$ ,  $\text{TiO}_2$ ,  $\text{SiO}_2$ , and hierarchically structured Mesoporous silica rods with diameters of about 125-150 nm were grown in polycarbonate membranes. This technique offers the advantages of growing large areas of uniformly sized nanorods with nearly unidirectional alignments. Further research into the fundamental science underlying sol-gel electrophoresis and physical properties of such nanorods is suggested. We also suggest an examination of other applications of this technique, such as the growth of thick films, mesoporous materials, functionally graded materials, or ordered macroporous materials.