Abstract

The simulation of photonic devices on a multi-layered structure is numerically difficult mainly because of the rapid field variation at the surface. Another numerical difficulty for numerical modelling is to truncate the dielectric media, which extends towards infinity. Standard low-order finite element and finite difference methods are inefficient for this class of problems. Therefore, it is highly desirable to develop efficient finite element methods able to simulate plasmonic structures. In this work, we apply high-order curvilinear finite elements for plasmonic particles in layered media with Perfectly Matched Layers (PMLs) [1]. We study the plasmonic behavior of particles in layered structures, where guided wave mode leads to unique features. To enhance the computational efficiency and accuracy, we develop adaptive strategies, especially inside the PML region, using the $hp$-finite element code CONCEPTS [2]. The FEM solutions are also compared with Multiple Multipole Program (MMP) [3].