**Abstract**

Based on vector diffraction theory and inverse Faraday effect, we numerically studied the magnetization induced by a tightly focused circularly polarized annular multi-Gaussian beam. Numerical result shows that the magnetization spot as small as 0.4 *λ* which extends up to 8 *λ* can be induced for incident circularly polarized annular multi-Gaussian beam (CPAMGB). We also noted that the depth of focus of the generated magnetization spot can be very well improved up to 48 *λ* through suitable phase modulation to the incident CPAMGB by means of specially designed complex phase filter. Moreover, we also noted that one can generate a chain of magnetization spots of different numbers and sizes upon suitably changing the beam order of CPAMGB and radii of complex phase filter. We expect that such a study will be fruitful for experimental realization of all-optical magnetic recording, multiple magnetic particle trapping and transportation, confocal and magnetic resonance microscopy, as well as multilayer ultra-high-density magnetic storage.