Subdiffraction plasmonic chain for magneto-optics enhancement

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We consider two scenarios of the Faraday rotation enhancement in magneto-optical subdiffraction waveguides. The waveguide itself is a well-known one-dimensional periodic array of plasmonic nanoparticles [1, 2], exhibiting magneto-optical properties [3, 4]. In the first case it is a passive periodic chain of plasmonic nanoparticles embedded into low-loss dielectric MO host medium. It is shown that the propagation of the guided mode travelling along the array is accompanied by rotation of nanoparticles polarization (the Faraday effect). The angle of rotation is dozen times greater than one in the uniform MO material. However, the propagation length of modes of such a chain is strongly inhibited by Ohmic losses.

In the second case, we consider gain-assisted 1D chain of composite plasmonic nanoparticles embedded into MO medium. Gain is provided by active molecules in the core of a composite nanoparticle [5, 6]. The guided modes in such an array of composite nanoantennas exhibit high values of the Faraday rotation and propagation length.

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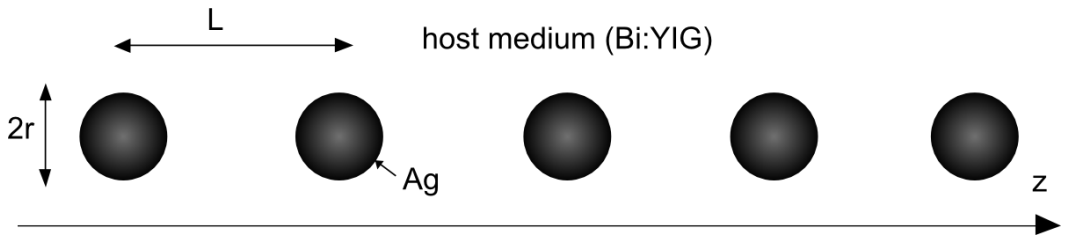

Fig. 1. A schematic drawing of the structure under consideration. Periodic chain of Ag nanoparticles each of radius *r* is embedded into magneto-optical medium, whose gyrotropy axis is directed along the chain.