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Magnetic and optical switching properties of Cu-Ni-Zn ferrite thin films via spin-spray deposition method

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We report relevant magnetic properties and reproducible optical switching performance of typical spinel structures in which the Cu-Ni-Zn ferrite thin films on SiO_2 substrates were fabricated by a spin-spray deposition method. Structure analysis indicates that the crystal structure of Cu-Ni-Zn ferrite film is spinel structure, which also has a columnar structure normal to the surface. The Cu-Ni-Zn ferrite films exhibit high permeabilities that exceed the Snoek limit for bulk ferrites. The ferrite films have relatively high permeability μ' ~ 600 up to 50 MHz and is promising to be used as thin film devices such as magnetic applications. Furthermore, we employed the electrical transport studies to understand the electrical properties by scanning out the resistance difference originated from the light. The result indicated clearly that the electrical transport is consistent with the light showing that uniform optical switching properties in the Cu-Ni-Zn ferrite films can be strongly affected by a subtle interplay between the photon and excited electrons. On the basis of the analysis of current-voltage characteristic and its light dependence, we discuss the origin of this effect and address the possibility of obtaining optical controlled Cu-Ni-Zn ferrite films for practical applications.

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