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Band structure of a 2D photonic crystal based on ferrofluids of $Co_{(1-x)}Zn_xFe_2O_4$ nanoparticles under perpendicular applied magnetic field JAVIER LOPEZ[1], LUZ ESTHER GONZALEZ, MARIO QUINONEZ, NELSON PORRAS, GUSTAVO ZAMBRANO, MARIA ELENA GOMEZ, Univ del Valle — Using a ferrfluid of cobalt-zinc ferrite nanoparticles $Co_{(1-x)}Zn_xFe_2O_4$ coated with oleic acid and suspended in ethanol, we have fabricated a 2D photonic crystal (PC) by the application of an external magnetic field perpendicular to the plane of the ferrofluid. The 2D PC is made by rods of nanoparticles organized in a hexagonal structure. By means of the plane-wave expansion method, we study its photonic band structure (PBS) which depends on the effective permittivity and on the area ratio of the liquid phase. Additionaly, taking into account the Maxwell-Garnett theory we calculated the effective permittivity of the rods. We have found that the effective refractive index of the ferrofluid increases with its magnetization. Using these results we calculate the band structure of the photonic crystal at different applied magnetic fields, finding that the increase of the applied magnetic field shifts the band structure to lower frequencies with the appearance of more band gaps. This work has been supported by the "El Patrimonio Autonomo Fondo Nacional de Financiamiento para CTI FJC" Colciencias-CENM Research Projects: No. 1106-48-925531 and CI7917-CC 10510 contract 0002-2013 COLCIENCIAS-UNIVALLE.

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