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The Effect of Heat Inducing Magnetic Instabilities on the Dynamic Hysteresis Characteristics in FePt thin-film: Finite Element and Monte Carlo Investigation

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In this study, the magnetization and hysteresis of thin film were study under the applying magnetic field and laser pulses by using the Monte Carlo and Finite Element method. The results show that the hysteresis loop will be existed when the frequency of applied laser pulse is a multiple integer time the frequency of magnetic field. If the frequency of laser pulse that is non-integer times the frequency of magnetic field, the hysteresis loop will not occur due to asynchronous between laser pulse and magnetic field. The existed hysteresis has two types are symmetric and asymmetric shape. The symmetric hysteresis has one coercivity value and has existed when the frequency of laser pulse is even integer times the magnetic field frequency. On the other hand, the asymmetric hysteresis has two coercivity values and has existed when frequency of laser pulse is odd integer times the magnetic field frequency. Moreover, the magnetic coercivity will varies depend on the frequency of laser pulse relate to the magnetic field and the highest temperature during heating cycle will decrease when the frequency of laser pulse is increased. These results indicate that the efficiency way of applied heat to reduce the coercivity should consider the frequency between the magnetic field and heat pulses during writing process which help to prevent the excessive heat usage.

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