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 研究論文

(Bi,A)FeO₃薄膜 (A = Ca, Sr, Ba (アルカリ土類金属)) の結晶構造と磁気特性に
 およぼすレーザーアシスト加熱成膜・後アニールの効果

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Effect of laser-assisted heating and annealing on the crystal structure and
 magnetic properties of (Bi, A) FeO₃ (A=Ca, Sr, Ba (alkaline earth metal)) thin films

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High saturation magnetization is required for BiFeO₃-based multiferroic (ferromagnetic/ferroelectric) thin films to apply magnetic writing element of Racetrack Memory which is a next-generation magnetic recording device. A newly introduced laser-assisted heating system was used to form high quality (Bi, A) FeO₃ (A=Ca, Sr, Ba (alkaline earth metal)) thin films. The maximum substrate temperature was increased from 695 to about 858°C by using this laser-assisted heating system combining with lamp heating system of sputtering equipment. In the case of (Bi, Ca) FeO₃ and (Bi, Sr) FeO₃ with the Ca or Sr substitution concentration of 50~60 at% fabricated by using the laser-assisted heating system, the crystallinity was improved, but oxygen vacancy could not be suppressed. As the result, saturation magnetization was not large. In the case of (Bi, Ba) FeO₃ with the Ba substitution concentration of 50~60 at% fabricated by using the laser-assisted heating system, oxygen vacancy could be suppressed. As the result, highest saturation magnetization of around 100 emu/cm³ was obtained in (Bi, Ba) FeO₃ thin films.

Keywords : Multiferroic thin films, crystalline structure, Saturation magnetization, Laser assisted heating, New magnetic recording devices