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An in-situ measurement of the magnetostrictive coefficient and elastic properties for thin films during the growth

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A determination method of the magnetostrictive coefficient and the elastic properties (Young's modulus and Poisson ratio) in a thin film during the growth was developed based on minimization of the total elastic energy of a cantilever film-substrate system. Comparing with the published measurement method, an inaccuracy in the magnetostrictive coefficient, caused by assuming the elastic properties of the film as those of the bulk material, could be avoided and only one elastic isotropic substrate is employed in the present method. The experimental data of an Fe-based amorphous thin film was analysed by using the model. The calculated dependence of magnetostrictive coefficient on the external magnetic field was compared with the experiment, and the discrepancy between both results are explained. Furthermore, the elastic properties of the film are also obtained.