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Analysis of Indentation Size Effect (ISE) Behavior in Low-Load Vickers Microhardness Testing of $(Sm123)_{1-x}(Nd123)_x$ Superconductor System SUKRU CELIK, R.T.E.U., Department of Physics, Rize, Turkey, OZGUR OZTURK, 2Kastamonu University, Department of Physics, Kastamonu, Turkey, ELVAN COŞKUN, R.T.E.U., Department of Physics, Rize, Turkey, ELIF ASIKUZU, 2Kastamonu University, Department of Physics 37100 Kastamonu, Turkey, KEMAL OZTURK, K.T.U., Department of Physics, Trabzon, Turkey, CABIR TERZIOGLU, A.I.B.U., Department of Physics, Bolu, Turkey — Indentation size effect (*ISE*) for $(Sm123)_{1-x}(Nd123)_x$ superconducting samples which were fabricated by the solid state reaction technique for values of x=0.00, 0.05, 0.10, 0.20, and 0.30 was investigated by analyzing the theoretical models. When the experimental data of a number of single crystals which have the different crystal structure and different chemical bonding inside the polycrystallined samples were analyzed with the *ISE* models, the sample encountering with resistance and elastic deformation was observed as well as plastic deformation. The microhardness values on different surfaces of materials were calculated by using Meyer Law, *PSR* model, MPSR model, *EDP* (Elastic / Plastic Deformation model) model and the Hays-Kendall (*HK*) approach. The results showed that the Hays- Kendall approach was determined as the most successful model. Furthermore, XRD and SEM measurements were analyzed for superconducting properties of $(Sm123)_{1-x}(Nd123)_x$ superconductor system. The results showed that while Nd123 concentration is increasing, microhardness values at the minimum load and averaged plateau region of load.

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