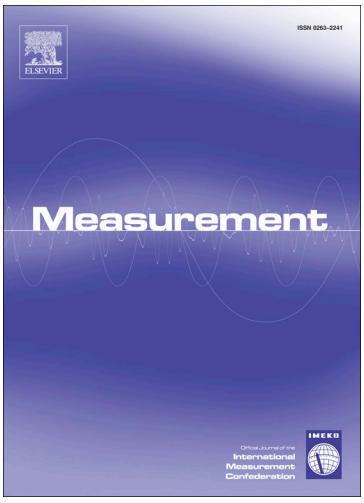

Design, development, and testing of a thermopower measurement system by studying the electron transport properties on Indium and Nitrogen co-doped sputtered ZnO films

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Design, development, and testing of a thermopower measurement system by studying the electron transport properties on Indium and Nitrogen co-doped sputtered ZnO films

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A compact thermopower measurement system has been indigenously designed, developed, and tested in-house by performing the measurements of the electron transport properties of reactively sputtered indium and nitrogen co-doped ZnO thin films (In, N: ZnO). This setup is capable of measuring the absolute thermoelectric power (TEP), also called absolute thermopower or absolute Seebeck coefficient, of any sample from 400 to 20 K efficiently. The sensitivity, accuracy, reliability, and reproducibility of this thermopower measurement system have been investigated by extending the test measurements on other reference materials, namely Cu, Ni, Al, Pb, and Sb. In all cases, the measurement error of the setup was found to be less than 3%. In order to detect the p-type conductivity in co-doped ZnO thin films, particularly at low temperature, a series of thermopower experiments were conducted. These measurements exhibited negative Seebeck coefficient down to 40 K establishing the n-type behavior of the co-doped ZnO films.