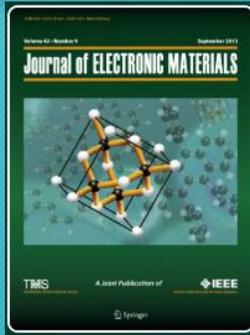


S. Saritas, T. Çolakoğlu, B. Emre, **A. Yildiz**  
 Facile and Cost-Effective Production of High-Performance  $\text{Bi}_2\text{Te}_3$ -Based  
 Thermoelectric Materials



Published in *Journal of Electronic Materials*,

October 2025

(SCIE-Q2, Impact Factor: 2.5)

Recently published by

**Prof. Dr. Abdullah YILDIZ,**  
**Energy Systems Engineering**

Journal of Electronic Materials  
<https://doi.org/10.1007/s11664-025-12531-0>

ORIGINAL RESEARCH ARTICLE



## Facile and Cost-Effective Production of High-Performance $\text{Bi}_2\text{Te}_3$ -Based Thermoelectric Materials

S. Saritas<sup>1,2,3</sup> · T. Çolakoğlu<sup>2,4</sup> · B. Emre<sup>2</sup> · A. Yildiz<sup>5</sup>

Received: 27 May 2025 / Accepted: 27 October 2025  
 © The Minerals, Metals & Materials Society 2025

### Abstract

Thermoelectrics have the potential to be utilized for localized power generation and refrigeration by enabling direct conversion between heat and electrical energy. In this study, we present a simple and affordable approach for the synthesis of high-performance  $\text{Bi}_2\text{Te}_3$ -based thermoelectric (TE) materials using cold press (CP) and cold isostatic press (CIP) methods. The results indicate that  $\text{Bi}_2\text{Te}_3$ -based materials synthesized using this approach exhibit remarkable TE performance, with cost-effective and simple production. A notable enhancement in power factor (PF) values was observed upon transition from CP to CIP. The PF increased from 0.57 mW/m·K<sup>2</sup> to 1.0 mW/m·K<sup>2</sup> for the *n*-type BiTeSe sample and from 1.0 mW/m·K<sup>2</sup> to 2.34 mW/m·K<sup>2</sup> for the *p*-type BiSbTe sample. In samples subjected to consecutive CP and CIP processes, a simultaneous enhancement in electrical conductivity and reduction in thermal conductivity contributed to an enhanced ZT value at room temperature, increasing from 0.4 to 0.8 for the *n*-type BiTeSe sample and from 0.4 to 1.5 for the *p*-type BiSbTe sample. This approach thus provides an alternative solution for the scalable and cost-effective production of  $\text{Bi}_2\text{Te}_3$ -based TE materials, which have potential applications in waste heat recovery and solid-state cooling.

**Keywords** Thermoelectrics ·  $\text{Bi}_2\text{Te}_3$  · power factor · cold press · cold isostatic press

# Filiz KELEŞ, Abdullah ATILGAN, Elif DAMGACI, Ayşe SEYHAN, **Abdullah YILDIZ** A Comprehensive Study on the Structural, Electrical and Optical Properties of DC Sputtered Molybdenum Thin Films



Published in *The Turkish Journal of Physics*,

October 2025

(ESCI-Q3, Impact Factor: 1.4)

Recently published by

**Prof. Dr. Abdullah YILDIZ,**  
**Energy Systems Engineering**



Turkish Journal of Physics  
<http://journals.tubitak.gov.tr/physics/>

Research Article

Turk J Phys  
(2025) 49: 233 – 243  
© TÜBİTAK  
doi:10.55730/1300-0101.2789

## A comprehensive study on the structural, electrical and optical properties of DC sputtered Molybdenum thin films

Filiz KELEŞ<sup>1,2,\*</sup>, Abdullah ATILGAN<sup>3</sup>, Elif DAMGACI<sup>4</sup>, Ayşe SEYHAN<sup>1,2</sup>,  
Abdullah YILDIZ<sup>5</sup>

<sup>1</sup>Department of Physics, Niğde Ömer Halisdemir University, Niğde, Türkiye

<sup>2</sup>Nanotechnology Application & Research Center, Niğde Ömer Halisdemir University, Niğde, Türkiye

<sup>3</sup>Central Research Laboratory Application and Research Center, Ankara Yıldırım Beyazıt University, Ankara, Türkiye

<sup>4</sup>Department of Metallurgical and Materials Science Engineering, Nevşehir Hacı Bektaş Veli University, Nevşehir, Türkiye

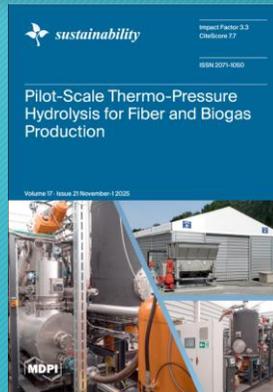
<sup>5</sup>Department of Energy Systems Engineering, Ankara Yıldırım Beyazıt University, Ankara, Türkiye

Received: 28.05.2025 • Accepted/Published Online: 14.08.2025 • Final Version: 20.10.2025

**Abstract:** This study investigates the influence of key deposition parameters on the optoelectronic properties of Molybdenum (Mo) films fabricated via DC magnetron sputtering. The results demonstrate that increasing the Argon gas pressure significantly raises the sheet resistance, primarily due to increased porosity and defect formation. In contrast, films deposited at lower pressures exhibit higher conductivity due to their denser morphology. The substrate temperature also plays a critical role in determining crystallographic structure and electrical performance. Mo bilayer films deposited at 250 °C show a much lower sheet resistance compared to room temperature (RT) growth. Additionally, increasing the total film thickness from 500 nm to 900 nm improves crystallinity, enlarges grain size, and reduces dislocation density. X-ray diffraction (XRD) analysis confirms a predominant (110) orientation, while UV-Vis spectroscopy indicates enhanced reflectance in the near-infrared (NIR) region, reaching up to 70%. These findings provide valuable insights for optimizing Mo thin films to achieve superior conductivity, mechanical stability, and optical performance.

**Key words:** Molybdenum thin films, DC magnetron sputtering, film thickness, working gas pressure, substrate temperature

# Mohammed Albaba, Morgan Pierce and **Bülent Yeşilata** A Real-World Case Study of Solar Pv Integration for Ev Charging and Residential Energy Demand in Ireland



Published in *Sustainability*,  
October 2025

(SCIE-Q2, Impact Factor: 3.3)

Recently published by  
**Prof. Dr. Bülent Yeşilata,**  
**Energy Systems Engineering**



Article

## A Real-World Case Study of Solar Pv Integration for Ev Charging and Residential Energy Demand in Ireland

Mohammed Albaba <sup>1,\*</sup>, Morgan Pierce <sup>2</sup> and Bülent Yeşilata <sup>1</sup>

<sup>1</sup> Energy Systems Engineering Department, Graduate School of Natural and Applied Sciences, Ankara Yıldırım Beyazıt University, Ankara 06010, Türkiye; byesilata@aybu.edu.tr

<sup>2</sup> SolarSmart Energy Ltd., D17 W267 Dublin, Ireland; morgan@solarsmart.ie

\* Correspondence: 215106401@aybu.edu.tr

### Abstract

The integration of residential solar photovoltaic (PV) systems with electric vehicle (EV) charging infrastructure offers significant potential for reducing carbon emissions and enhancing energy autonomy. This study presents a real-world case of a solar-powered EV charging system installed at a residential property in Dublin, Ireland. Unlike prior studies that rely solely on simulation, this work covers the complete process from digital design using OpenSolar to on-site installation and performance evaluation. The system includes 16 high-efficiency solar panels (435 W each), a 4 kW hybrid inverter, a 5.3 kWh lithium-ion battery, and a smart EV charger. Real-time monitoring tools were used to collect energy performance data post-installation. The results indicate that 67% of the household's solar energy was self-consumed, leading to a 50% reduction in electricity costs. In summer 2024, the client achieved full grid independence and received a €90 credit through feed-in tariffs. The system also enabled free EV charging and generated environmental benefits equivalent to planting 315 trees. This study provides empirical evidence supporting the practical feasibility and economic–environmental advantages of integrated PV–EV systems in temperate climates.

**Keywords:** solar photovoltaic (PV); electric vehicle charging; residential energy systems; energy monitoring; self-consumption

