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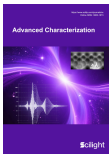

*Editorial*

# *Advanced Characterization*—A New Platform for Characterization Community

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Received: 1 July 2026; Accepted: 2 July 2026; Published: 2 July 2026

**How To Cite:** Zhu, J. *Advanced Characterization*—A New Platform for Characterization Community. *Advanced Characterization* **2026**, *1*(1), 112–114. https://doi.org/10.53941/ac.2026.100009

## 1. Introduction

The capacity to perceive is a prerequisite for comprehension, and the ability to quantify serves as the cornerstone of engineering endeavors. Throughout the expansive fields of materials science, chemistry, physics, and device engineering, advanced characterization techniques have transitioned from being auxiliary tools to becoming the central driving force behind scientific discovery—they delineate the boundaries of our knowledge and, consequently, the scope of our creative potential. The sophistication of contemporary characterization methods now enables us to observe materials not merely as static entities but as dynamic, responsive systems operating under realistic conditions. Nevertheless, despite this remarkable progress, the characterization community has long been devoid of a dedicated, interdisciplinary platform that unifies innovations in microscopy, spectroscopy, diffraction, and computational modeling under a singular editorial vision. It is with this understanding that we proudly introduce *Advanced Characterization*, a multidisciplinary, open-access journal published by Scilight Press, dedicated to serving as the premier forum for the global characterization science community.

## 2. Aim and Scope

The scope of *Advanced Characterization* is intentionally broad and integrative, mirroring the reality that the most significant advances in characterization increasingly emerge at the intersections of traditional disciplinary boundaries. The journal welcomes high-quality research articles, reviews, perspectives and communications that span the entire spectrum of characterization—from novel advancements in scanning probe microscopy, electron microscopy, and synchrotron-based X-ray techniques (including X-ray absorption spectroscopy, diffraction, and photoelectron spectroscopy) to cutting-edge spectroscopic methods such as tip-enhanced Raman spectroscopy and operando vibrational spectroscopy.

It is our great pleasure to present the inaugural issue of *Advanced Characterization*. The eight contributions in this issue—four original research articles and four reviews—span environmental remediation, photovoltaics, surface chemistry, catalysis, energy storage, low-dimensional materials, and interfacial science. Together, they demonstrate the central role of advanced characterization in revealing buried structures, identifying active sites, following dynamic transformations, and establishing quantitative structure–property relationships. Ma et al. report a mechanistic investigation of enhanced uranium(VI) removal by nitrogen-modified zerovalent iron synthesized through mechanochemical ball milling, elucidated by X-ray absorption fine structure and other characterization techniques [1]. Zhang et al. address one of the persistent challenges in thin-film science: the nondestructive characterization of buried interfaces. They construct a non-destructive depth-resolved phase mapping of methylammonium lead iodide perovskite buried interfaces via combined back- and surface-incidence grazing-incidence X-ray diffraction [2]. The importance of observing materials under realistic working conditions is emphasized in the review by Xu et al. on $CeO_x$ interfaces in model catalytic reactions. The authors present a spectroscopic perspective on the dynamic interfacial chemistry of ceria-based model catalysts, highlighting advances in near-ambient-pressure X-ray photoelectron spectroscopy and X-ray absorption spectroscopy [3]. At

the atomic and molecular scale, Gezmis et al. investigate reversible coordination-driven phase transformations in Fe–4,4′-bipyridine two-dimensional metal-organic frameworks on Au(111) using scanning tunneling microscopy and density functional theory [4], Dynamic and multimodal characterization is further exemplified by Zhang et al., who develop a platform combining *operando* synchrotron X-ray diffraction, X-ray absorption fine structure, and online mass spectrometry to investigate structural degradation, nickel redox evolution, and oxygen release during thermal decomposition of ultra-high-nickel battery cathodes [5] Fe-coordinated 4,4-bipyridine networks assembled on Au(111). Choyal et al. comprehensively review the relation of film thickness, lattice mismatch, point and extended defects, and oxide–metal charge transfer with the catalytic reactivities in ultrathin oxide film model catalytic systems via scanning probe microscopy [6]. Campbell and Singh review methods for characterizing adsorption at solid–liquid interfaces, including approaches for determining adsorbate identity, coverage, kinetics, internal energies, activation free energies, solvent effects, and the influence of interfacial electric fields, which are essential for constructing accurate microkinetic models and identifying the intermediates that control catalytic activity and selectivity [7]. Finally, Li et al. establish a unified framework for using core-level photoelectron spectroscopy to characterize structural variations in layered transition-metal dichalcogenides [8]. They demonstrate that vacancy defects, self-intercalation, periodic lattice distortions, interlayer sliding, and structural phase transitions produce distinct changes in binding energies, spectral splitting, and line shapes of photoelectron spectroscopy.

Taken together, these eight contributions define the scientific identity of *Advanced Characterization*. They emphasize interfaces rather than ideal bulk structures, working states rather than static endpoints, complementary measurements rather than single-technique conclusions, and mechanistic understanding rather than descriptive data. They also demonstrate that characterization is inherently interdisciplinary: defects, gradients, adsorption, charge transfer, phase evolution, and structure–property relationships recur across physics, chemistry, materials science, energy, and environmental research. The journal's remit extends equally to biological and biomedical characterization, where heterogeneous and dynamic systems demand similarly integrative measurement strategies. Beyond experimental techniques, we also actively encourage computational and data-driven approaches—including density functional theory, machine-learning-assisted image analysis, and multiscale modeling—that enhance the interpretation, prediction, and optimization of characterization data and experimental design. The journal encompasses characterization across all material classes: nanomaterials, advanced ceramics, polymers and composites, biomaterials, energy materials, low-dimensional systems, and beyond. We place particular emphasis on studies that establish rigorous structure–property–performance relationships, uncover mechanistic insights at the atomic and molecular levels, and demonstrate practical relevance to applications in catalysis, energy storage and conversion, environmental remediation, electronics, and biomedical engineering.

## 3. Outlook

Looking forward, we envision *Advanced Characterization* evolving beyond a mere repository of outstanding research—we aim to foster a dynamic intellectual community where experimentalists, theorists, and instrument developers converge to shape the next generation of characterization paradigms. The accelerating integration of artificial intelligence into characterization workflows, the emergence of ultrafast and quantum-enabled measurement modalities, and the escalating demand for operando and multi-modal correlative platforms under industrially relevant conditions all herald an era in which characterization will not only report on materials but actively guide their discovery and optimization in real time. Realizing this vision hinges on the collective engagement of the global scientific community—we invite researchers and engineers from academia and industry to contribute their most innovative work, to serve as reviewers and editorial members, and to help mold this journal into a trusted, authoritative, and forward-looking reference point for the field. With the support of a distinguished international editorial board, a rigorous and transparent peer-review process, and a commitment to open access that maximizes the visibility and impact of published research, we are confident that *Advanced Characterization* will emerge as an indispensable resource at the forefront of characterization science for years to come.

## Conflicts of Interest

The author declares no conflict of interest.

## Use of AI and AI-Assisted Technologies

During the preparation of this work, the author used Chat GPT to draft the Introduction and Outlook section. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

## References


1. Ma, L.; Fan, P.; Hou, K.; et al. Enhanced Removal of Uranium(VI) by Nitrogen-Modified Zerovalent Iron Synthesized via Mechanochemically Ball Milling. *Adv. Charact.* **2026**, *1*, 1–11.
2. Zhang, L.; Zheng, G.; Su, Z.; et al. Probing Buried Interfaces and Phase Gradients in $MAPbI_3$ Films via Combined Back- and Surface-Incidence GIXRD. *Adv. Charact.* **2026**, *1*, 12–21.
3. Xu, J.; Sun, W.; Liang, Z.; et al. Spectroscopic Advances towards the Fundamental Understanding of CeO_x Interfaces in Model Catalysis Reactions. *Adv. Charact.* **2026**, *1*, 22–39.
4. Gezmis, A.; Steinbach, S.; Steffen, J.; et al. Reversible Structure Formation in 4,4-Bipyridine–Fe 2D Metal–Organic Frameworks on Au(111). *Adv. Charact.* **2026**, *1*, 40–58.
5. Zhang, Y.; Liu, H.; Li, Z.; et al. Deciphering the “Thermal Snap” on Ultra-High Ni Cathodes via Multi-Modal *Operando* Synchrotron X-ray and Mass Spectrometry. *Adv. Charact.* **2026**, *1*, 59–70.
6. Choyal, S.; Rajak, S.; Jiang, N. Ultrathin Oxide Films for Heterogeneous Catalysis: Structure, Defects, and Reactivity. *Adv. Charact.* **2026**, *1*, 71–83.
7. Campbell, C. T.; Singh, N. Methods for Characterizing Adsorption on Solid Surfaces in Liquids. *Adv. Charact.* **2026**, *1*, 84–97.
8. Li, H.; Xu, H.; Cao, L. Photoelectron Spectroscopy for Structural Characterization of Layered Transition Metal Dichalcogenides. *Adv. Charact.* **2026**, *1*, 98–111.