

Summary for Distinguished Professorship Award Application

Florian J. Stadler, Professor of Chemical Engineering, KFUPM

1) Impact of Published Work

My research spans polymer rheology, soft matter physics, nanomaterials, and functional gels. The work has produced sustained impact across fundamental methods and application-oriented materials.

- **Citation profile.** Google Scholar lists >20,000 citations with an h-index of 78; Scopus lists 17,518 citations across 352 documents with an h-index of 71. These independent databases capture both methodological and applied influence across chemistry, chemical engineering, materials, and physics. Scopus's "document & citation trends" chart shows steady growth and a sustained high annual citation rate through 2024, reflecting both legacy impact in polymer rheology and recent visibility in soft materials and energy-adjacent topics.
- **Methods adopted by the community.**
 - *AFM Mech Suite* for nanomechanics of heterogeneous soft materials (Nature Communications, 2018) is widely used for quantitative AFM-based mechanics in gels and biomaterials. It addressed reproducibility and analysis gaps, enabling reliable modulus mapping for soft matter.
 - A **general method to compute continuous relaxation spectra** from dynamic-mechanical data is now a standard tool for linking viscoelastic spectra to polymer architecture. It has been used to quantify branching and network defects in industrial polyolefins and model gels.
 - A **classification of thermorheological complexity** in linear and branched polyolefins clarified when time-temperature superposition fails and why—work that has shaped how industry interprets rheometry for processing windows.
 - **Quantification of primary loops in polymer gels** (PNAS, 2013) provided the first practical rheological route to defect counting in end-linked networks, informing gel design for biomedical and soft-robotics use.
- **Materials with translational pull.**

My group has reported supramolecular and zwitterionic hydrogels with rapid self-healing and multi-stimuli response; dense bottlebrush architectures that form **supersoft, solvent-free networks**; and hybrid nanocomposites for gas sensing, photocatalysis, and energy-relevant interfaces. These themes map onto membranes, sensors, coatings, and soft devices.
- **Breadth and collaboration.**

Output covers polymer physics, soft matter, nanocomposites, electrochemistry interfaces, and bio-materials. The portfolio includes high-impact outlets (e.g., Nature Communications, Advanced Materials/Functional Materials, Energy & Environmental Science, Journal of Rheology, Macromolecules) and sustained co-authorship across chemistry, physics, and engineering groups.

2) Scientific Contributions to the Publications

- **Concept and theory → experiment loops.**

My core contribution has been to connect **molecular architecture** to **rheological signatures** and then to **processing-relevant properties**. Examples include establishing correlations between long-chain branching and viscosity spectra; defining damping functions; and demonstrating when thermorheological simplicity breaks down in commercial-grade materials. I designed or co-designed study concepts, built the analysis pipelines, and led interpretation.

- **Method development and open tools.**

Beyond AFMEch Suite, I introduced **LAOS-based protocols** for supramolecular networks, **relaxation-spectrum inversion** workflows for incomplete datasets, and **network-defect metrology** for gels. These have been reused by labs working on elastomers, hydrogels, and polyolefins.

- **Senior authorship and mentoring roles.**

Scopus author analytics for the past decade attribute **~60% of my papers as last author (151 items)**, a proxy for leadership on idea formulation, supervision, and manuscript synthesis. I also serve as corresponding author across collaborations to ensure methodological rigor and transparent data reporting.

- **Cross-disciplinary integration.**

I link **rheology and AFM nanomechanics** with **materials chemistry** to answer structure–property questions in systems ranging from ionic-liquid gels to bio-inspired networks and conductive polymer composites. My role typically couples the physical modeling with quantitative characterization and the final mechanistic narrative.

3) Research Leadership

- **Group building at KFUPM.**

At present I lead 1 postdoc, 4 PhD students, and 1 MSc student at KFUPM, plus 3 graduate students from my former university (Shenzhen). Two additional postdocs and one PhD student are joining, expanding capability in rheology, AFM nanomechanics, and functional gels. (*Counts per current status.*)

- **Editorial and community roles.**

Associate Editor, *Journal of Saudi Chemical Society*; Editorial Board, *Polymers* and *Rheologica Acta*; prior guest/special-issue editor for *Rheologica Acta*, *Polymers*, *Materials*, and *Journal of Composite Science*. I regularly review for high-impact journals and for national agencies including FWF (Austria), NWO (Netherlands), the Polish Science Foundation, and the US NSF.

- **Conference service.**

Scientific Committee member, **Saudi Chapter of the American Chemical Society** (Nov 11-13, 2025, International Chemistry & Chemical Engineering conference). (*Per current invitation.*)

- **Institutional service at KFUPM.**

Member, CHE Faculty Recruitment Committee; CHE Curriculum Committee; Chemistry Curriculum Revision Committee. (*Per current assignment.*)

- **Track record and appointments.**

Prior to joining KFUPM as Distinguished Professor in 2024, I served as Distinguished Professor at Shenzhen University (2014–2024) and earlier as Assistant/Associate Professor at Chonbuk National University, Korea. This track underscores experience in starting, scaling, and sustaining research programs in diverse environments.

- **Training and collaboration.**

I have supervised and co-supervised researchers across materials, chemical engineering, and physics, with many alumni placed in academia and industry. Collaborative projects span polymers, soft matter, energy materials, and bio-interfaces, often coupling rheology with microscopy and spectroscopy for full structure–property closure.

Direction at KFUPM

I will align soft-matter mechanics with the **Interdisciplinary Research Center for Refining and Advanced Chemicals**:

- (i) rheology-guided design of **solvent-free supersoft networks** and ion-conducting gels,
- (ii) **operando** micromechanics of polymer–filler and polymer–electrolyte interfaces, and
- (iii) data-driven links between processing windows and molecular architecture for **polyolefin circularity** and **advanced membranes**. These targets match KFUPM’s strategic goals in advanced materials and sustainable processes.