



## Swiss Science Concentrates

A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

### Validating Vacuum Chromatography with Subsecond Radioisotopes of Hg for Superheavy Element Chemistry

Georg Tiebel, Amelia S. Kirkland, Anna M. Bukowski, Titeana L. M. Cook, Rugard Dressler, Paul Duthel, Robert Eichler, Charles M. Folden III, Jenna R. Garcia, Isaac W. Haynes, Dominik Herrmann, Michael Hofstetter, Yuta Ito, Jordan A. Mildon, Tetsuya K. Sato, Evgeny E. Tereshatov, Alexander Vögele, Vira Zakusilova, and Patrick Steingeger\*

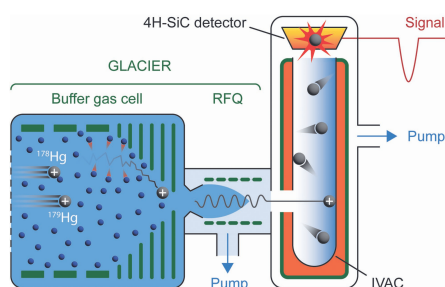
*J. Phys. Chem. C* **2026**, *130*, 3058,  
<https://doi.org/10.1021/acs.jpcc.5c06930>

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Isothermal vacuum adsorption chromatography (IVAC) was developed as a fast chemical separation technique for investigating superheavy element (SHE) isotopes with half-lives <1 second. The method was benchmarked using the short-lived mercury isotopes  $^{179}\text{Hg}$  ( $t_{1/2} \approx 1.05$  s) and  $^{178}\text{Hg}$  ( $t_{1/2} \approx 0.27$  s), produced *via* heavy-ion-induced nuclear fusion-evaporation reactions. The newly developed interface GLACIER, consisting of a buffer gas cell and RF quadrupole ion guide, enables efficient thermalization and transport of the nuclear reaction products into an evacuated fused-silica chromatography column. Migration in the molecular flow and the adsorption behaviour of mercury atoms were investigated by means of  $\alpha$ -decay spectroscopy and compared with Monte Carlo simulations based on the microscopic kinetic transport model at zero surface coverage. The good agreement between experiment and simulation confirms the validity of the employed transport model and demonstrates that IVAC can operate on millisecond timescales, highlighting its potential for future gas-phase chemical studies of SHEs beyond flerovium (Fl,  $Z = 114$ ).

#### Authors' comments:

“Experiments with SHEs provide chemical information at the extremes of the periodic table and teach us how relativistic effects impact the physico-chemical properties of heavy elements in general. IVAC is now being prepared for an experiment with moscovium (Mc,  $Z = 115$ ).”



### Enzyme-Responsive Hemostatic Elastin-like Polypeptides for Fibrin Stabilization and Coagulation Restoration in Thrombocytopenia

Yang Sun, Sunghyun Kang, Malvina Heiniger, Ivan Urosev, Rosario Vanella, Adrian Bertschi\*, and Michael A. Nash\*

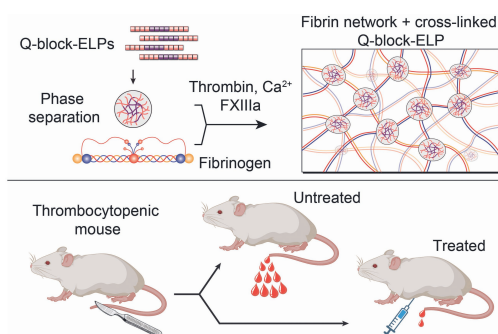
*J. Am. Chem. Soc.* **2026**, *148*, 5287,  
<https://doi.org/10.1021/jacs.5c18009>

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In this study, the authors developed enzyme-responsive glutamine (Q)-containing block elastin-like polypeptides (Q-block-ELPs) to enhance blood clot stability and control haemorrhage in thrombocytopenia. The Q-block-ELPs are recognized by coagulation factor XIIIa, enabling cross-linking with fibrin during clot formation. Furthermore, the polypeptides have a lower critical solution temperature below physiological temperature, enabling temperature-triggered phase separation and the formation of coacervates that integrate into the fibrin network. *In vitro* experiments showed that the Q-block-ELPs increased fibrin network density and stiffness, while *in vivo* studies in thrombocytopenic mouse models confirmed that systemic administration of the most promising construct effectively reduced blood loss and accelerated clot formation post-injury, presenting a programmable and scalable therapeutic strategy for managing bleeding in platelet-deficient conditions.

#### Authors' comments:

“This study represents a true team effort that spanned several years developing clot-targeting protein polymers that reinforce fibrin. We are excited because this platform now opens new opportunities for delivering therapeutics directly to sites of bleeding.”



## A Metallosupramolecular Receptor for Squaraine Dyes Enabling Ultrafast Dark Resonance Energy Transfer

Damien W. Chen, Tejas Deshpande, Sybille Collignon, Farzaneh Fadaei-Tirani, Sascha Feldmann, and Kay Severin\*

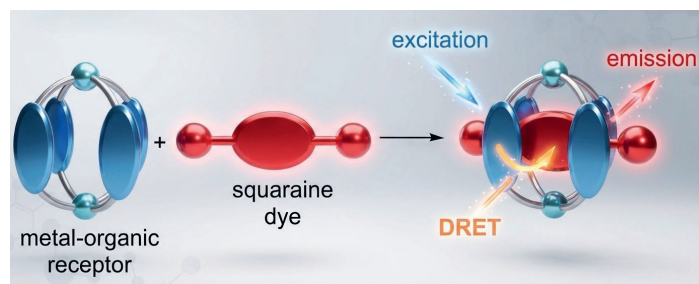
*Angew. Chem. Int. Ed.* **2026**, *11*, e2203782,  
<https://doi.org/10.1002/anie.2203782>

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Severin and coworkers have reported a Pd<sub>2</sub>L<sub>4</sub> metallosupramolecular cage, which was obtained from acridone-based dipyrindyl ligands and Pd<sup>2+</sup> ions. The cage acts as a selective receptor for squaraine dyes. It preferentially binds dyes bearing 2,6-dihydroxyphenyl substituents through hydrogen-bonding interactions within its cavity, forming stable host-guest complexes with association constants up to  $7.8 \times 10^4 \text{ M}^{-1}$ . Encapsulation induces red shifts in the absorption and emission spectra and enables efficient ultrafast dark resonance energy transfer (DRET) from the cage to the dye. Upon excitation of the host in the UV region, bright near-infrared emission from the encapsulated dye was observed, with *pseudo*-Stokes shifts of up to 440 nm. The energy transfer occurs on a sub-picosecond timescale and requires dye encapsulation within the cage. Additionally, chirality transfer to the host was observed upon binding of a chiral squaraine dye, detectable by circular dichroism spectroscopy. These findings demonstrate the potential of metallosupramolecular cages to control host-guest photophysics and to serve as promising platforms for the design of noncovalent DRET systems.

### Authors' comments:

"Our work demonstrates that coordination cages can serve as potent receptors for squaraine dyes. The host-guest complexes show intriguing photophysical properties."



## Structural Modulation and Enhanced Magnetic Ordering in Incommensurate K<sub>1-x</sub>CrSe<sub>2</sub> Crystals

Felix Eder<sup>a</sup>, Catherine Witteveen<sup>a,b</sup>, Enrico Giannini<sup>a</sup>, and Fabian O. von Rohr<sup>a,\*</sup>

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<https://doi.org/10.1021/jacs.4c13545>

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Designing magnetic properties through chemical composition and structure is a key goal in the development of functional layered materials. Eder *et al.* grew single crystals of the new layered chromium selenide K<sub>1-x</sub>CrSe<sub>2</sub> with  $x \approx 0.13$ . They show that the potassium deficiency drives an incommensurately modulated monoclinic structure. This structure can be described in a 3+1-dimensional model. The reduced K content forces a mismatch between the alkali-ion sublattice and the CrSe<sub>2</sub> sheets, producing pronounced wave-like undulations of the layers and an unusual ABAB stacking sequence. These structural distortions strongly affect the magnetic response. K<sub>1-x</sub>CrSe<sub>2</sub> orders below  $T_N = 133 \text{ K}$ , substantially above previously reported values for stoichiometric, not-modulated KCrSe<sub>2</sub> with an ABC stacking. The work demonstrates how controlled off-stoichiometry and structural modulation can be used to tune magnetic behaviour in layered materials.

### Authors' comments:

"Molten-metal flux synthesis proves to be a versatile route to the discovery of new phases and complex structures. Here, we uncover an incommensurately modulated chromium selenide that displays unexpectedly enhanced magnetic ordering."

