

Pharmaceutical material shows promise for better grid-scale batteries

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PNNL researchers developed the material in an effort to reduce the cost of redox flow batteries. Currently, many commercial redox flow batteries use a vanadium-based [electrolyte](#). Vanadium is primarily used in steel making and as commodity materials, its [costs](#) can vary based on supply and demand. To overcome these cost constraints, PNNL scientists have developed a new phenazine-based material as an alternative to vanadium as described in *Nature Energy*.

"This is a major development for organic flow batteries," said Imre Gyuk, Director of Energy Storage at DOE's Office of Electricity which supported this work at PNNL. "There is much interest around the potential for [water](#) soluble, organic redox materials as an alternative to vanadium-based batteries. However, the problem is getting the materials to actually dissolve in water and maintain the desired electrochemical properties."

The PNNL research team, led by chief scientist Wei Wang, knew that phenazine—a naturally occurring compound—possesses the needed redox reactions; but, was not water soluble. So, PNNL researchers developed a method of chemically modifying phenazine, producing a water-soluble derivative that also optimizes its redox properties. When dissolved in the electrolyte solution, the team found 90 percent of the dissolved phenazine available to carry energy.

According to Wang, modifying the phenazine is straightforward and scalable. While the team still needs to conduct a cost analysis, phenazine

precursor chemicals are readily available and inexpensive.

"The results are promising," said Wang. "We have not only developed a viable alternative to [vanadium](#), we have developed a structured, virtual screening approach that will help us identify new promising [materials](#)."

PNNL will continue testing a phenazine-based anolyte (negative electrolyte) and plans to develop a corresponding catholyte (positive electrolyte). Combined, the solutions could lead to new type of redox [flow](#) battery.

More information: Aaron Hollas et al. A biomimetic high-capacity phenazine-based anolyte for aqueous organic redox flow batteries, *Nature Energy* (2018). [DOI: 10.1038/s41560-018-0167-3](https://doi.org/10.1038/s41560-018-0167-3)

Provided by Pacific Northwest National Laboratory

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