

# Rapid and Inexpensive Method for the Purification of Proteorhodopsin



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## Invention

Proteorhodopsin acts as a light-driven proton pump whose resulting proton gradient can be harnessed for conversion into chemical energy. The pump supersedes all synthetically fabricated photonic materials due to its high degree of cyclicality, thermal stability, and quantum efficiency, making the pump an ideal candidate as a molecular switch in the growing field of molecular electronics. Current industrial applications have only implemented bacteriorhodopsin, a homolog of proteorhodopsin, and further potential for industrial scale-up of either protein suffers from the expensive and time-consuming purification process. This invention provides a novel purification methodology that enables low-cost and efficient industrial-scale purification of proteorhodopsin. This increased efficiency will expand the extent of reasonable applications for proteorhodopsin switches.

## Technology

This purification method of proteorhodopsin greatly reduces the cost and labor required for purification of the protein. The use of sodium citrate as a precipitant with low concentrations of non-ionic detergents enables the purification of proteorhodopsin from other membrane proteins and lipids. Sodium citrate is added to a solution of lysed cells expressing proteorhodopsin, and the solution is allowed to incubate. The precipitate can be gathered via centrifugation or chromatography. Sequential addition of sodium citrate to obtain varying detergent concentrations enables step-wise purification of the enzyme.

## Applications

- Optical switches
- Non-linear optical films
- Holographic interferometers
- Holographic data storage
- Medical sensors
- Quantum information and computing

## Advantages

- Purification provides 30-50% purity in a single step.
- Purification is not dependent upon the specific protein sequence, providing a versatile method that can be applied toward the purification of the wild type as well as site-directed mutants used to enhance the efficiency of the native protein.
- Purification does not require protein tagging, which would lengthen the purification process and possibly interfere with the function of the protein.
- The need for chromatography is eliminated or reduced depending on the intended purity level of protein, significantly reducing the cost of materials.



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