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Membrane Separation of Cu-67 for Use in Theranostics

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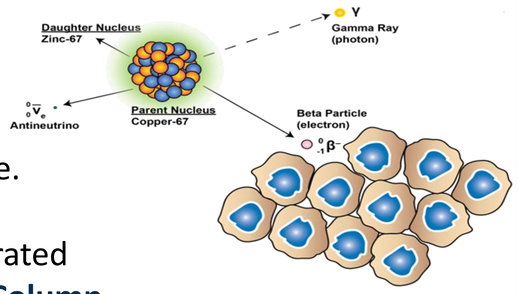
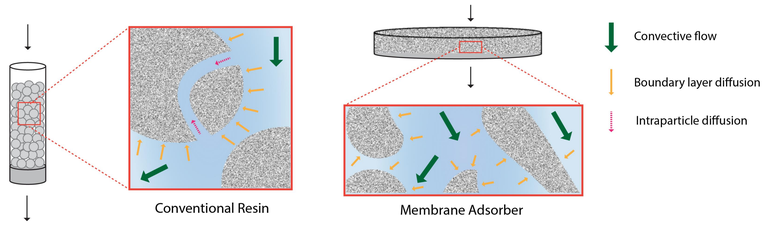
Motivation and Background Research

- Copper-67 experiences γ and β- decay which makes it ideal for cancer diagnosis and treatment (**Theranostic**)
- Its potential is well known, but its supply is limited due to its *2.58* day half-life.
- A zinc target is irradiated then dissolved and nanograms of copper have to be separated



Membrane vs. Column

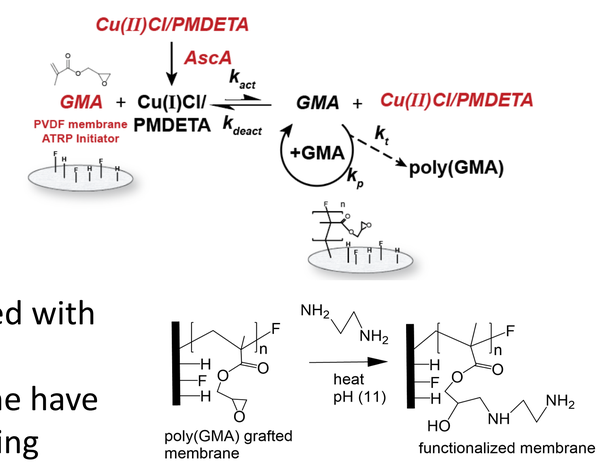
- Resin-packed columns are most common separation technique
- Columns involve complicated procedures that can take **3–4 h** for a 5 g target



- Unlike columns, membranes are not diffusion limited.
- Simple to operate and can increase overall throughput

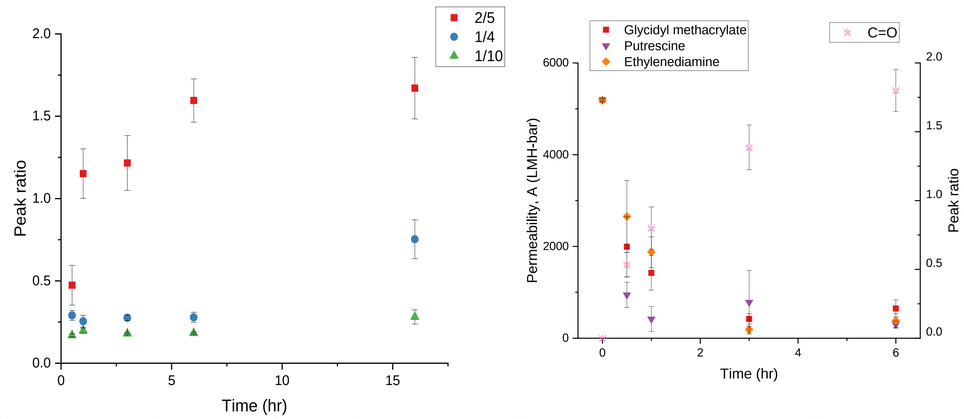
Membrane Modification

- **ATRP** is a controlled polymerization reaction and can be performed on the surface of a membrane under mild conditions.
- AGET ATRP is less sensitive to oxygen
- pGMA's epoxide group is opened with heat and can be functionalized
- Ethylene Diamine and Putrescine have been shown to have strong binding affinity with copper



Membrane Characterization

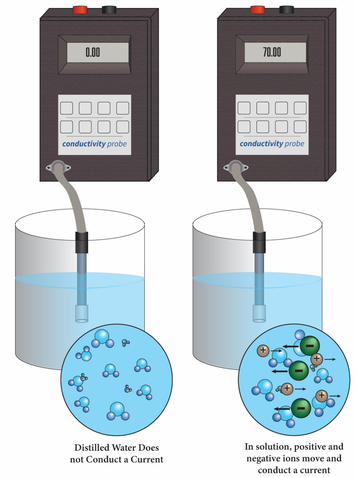
- FTIR allows for characterization of bonds at multiple stages in membrane development
- Pure Water flux is tested at various pressures in a stir cell to determine total throughput that is possible



Charts 1 and 2: On the Left, FTIR peak ratios increase with reaction time; on the right, permeability decreases with greater polymer graft

Further Research

- **Static binding** tests a membranes total capacity and selectivity
- Predetermined conductivity curves will be used to calculate concentration after binding
- **Titrations** will be performed to determine total binding sites
- **Dynamic Binding** will determine throughput and performance over time
- Competitive static binding may also be necessary to demonstrate selectivity



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