

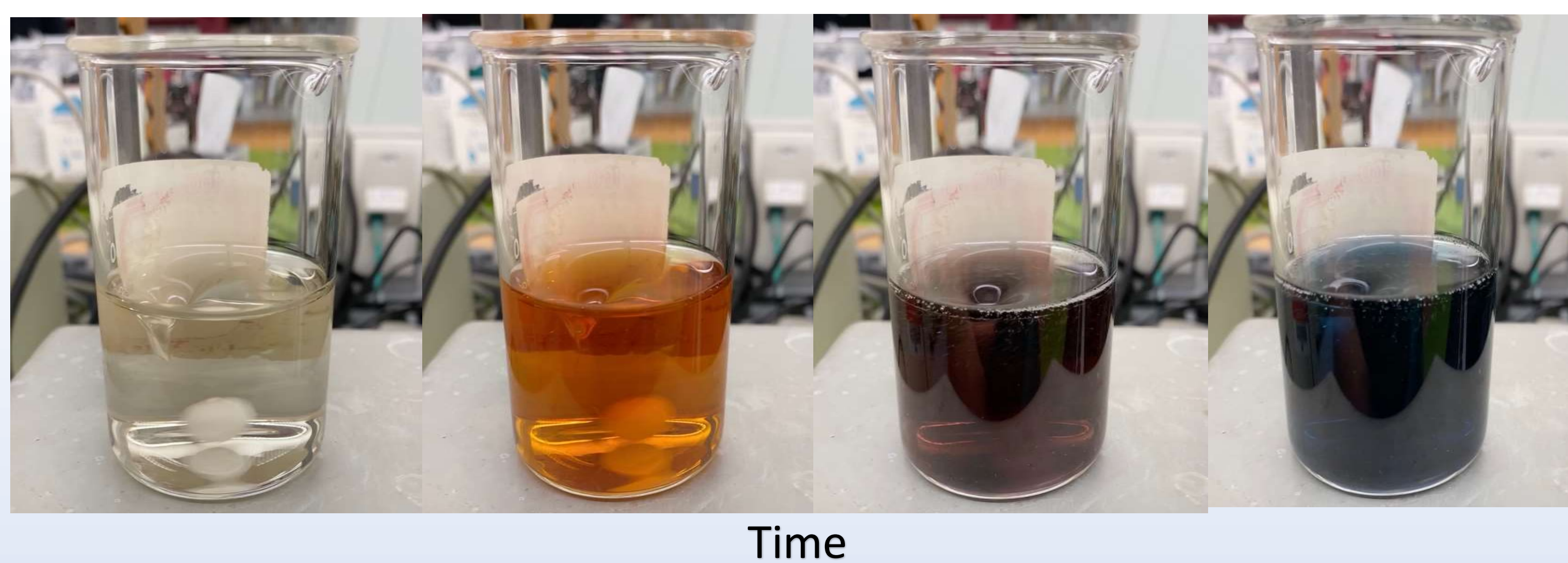
Abstract:

The recent interests in the field of nanoscience/bionanotechnology has brought nanoparticle research and development to a forefront in the scientific community. While the specific makeup and components of nanoparticles can vary vastly, common but extremely useful are silver nanoparticles (AgNPs). AgNPs are multifunctional and have applications across many fields such as healthcare, medicine, food, and industry. Recent studies have also shown antibacterial, antifungal, anti-inflammatory properties, and can be used in specific anti-cancer therapies. A significant tool in nanotechnology is the ability to control the shape and size of nanoparticles for specific applications. The focus of this study is to successfully synthesize and characterize multiple AgNP shapes as well as biofunctionalize the AgNPs to enable the immobilization of anti-cancer drugs on their surface.

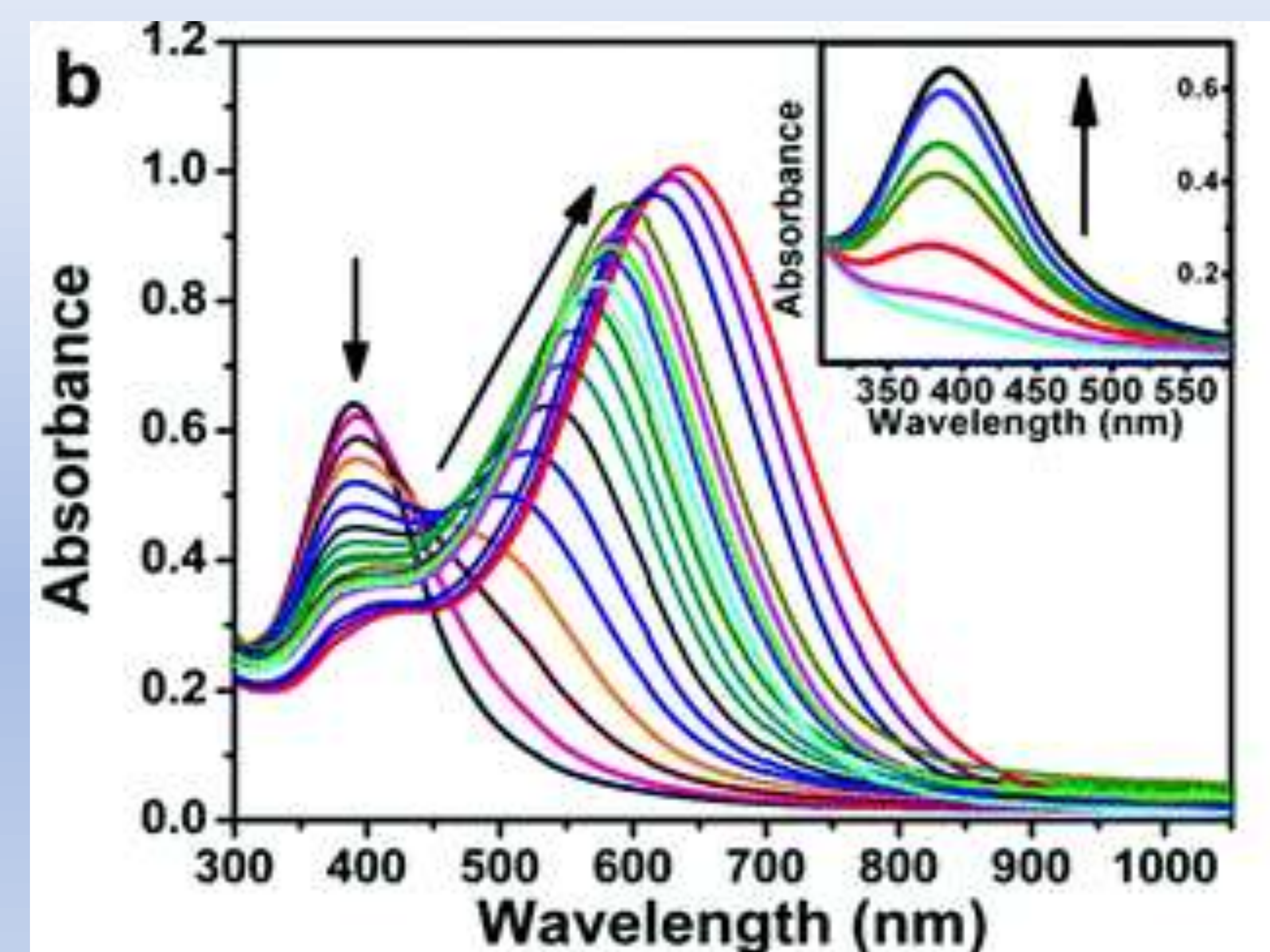
Experimental- Silver Nanoplate Synthesis Procedure:

- 750.0 μ L of 0.1 M Sodium Citrate soln, 50.0 μ L of 0.1M Silver Nitrate soln, 120.0 μ L of 30 wt % Hydrogen Peroxide, 0.2mL of 17.50 mM PVP soln were all added to a 50.0mL volumetric flask.
- Dilute soln to 50.0mL with miliq water, add solution a flask with stir bar and once soln begins stirring rapidly inject 500.0 μ L of fresh 0.1M Sodium Borohydride.
- Vigorously stir the solution at room temperature in air.
- Stir for up to 45 minutes in till rapid color change of solution occurs (light yellow to deep blue).

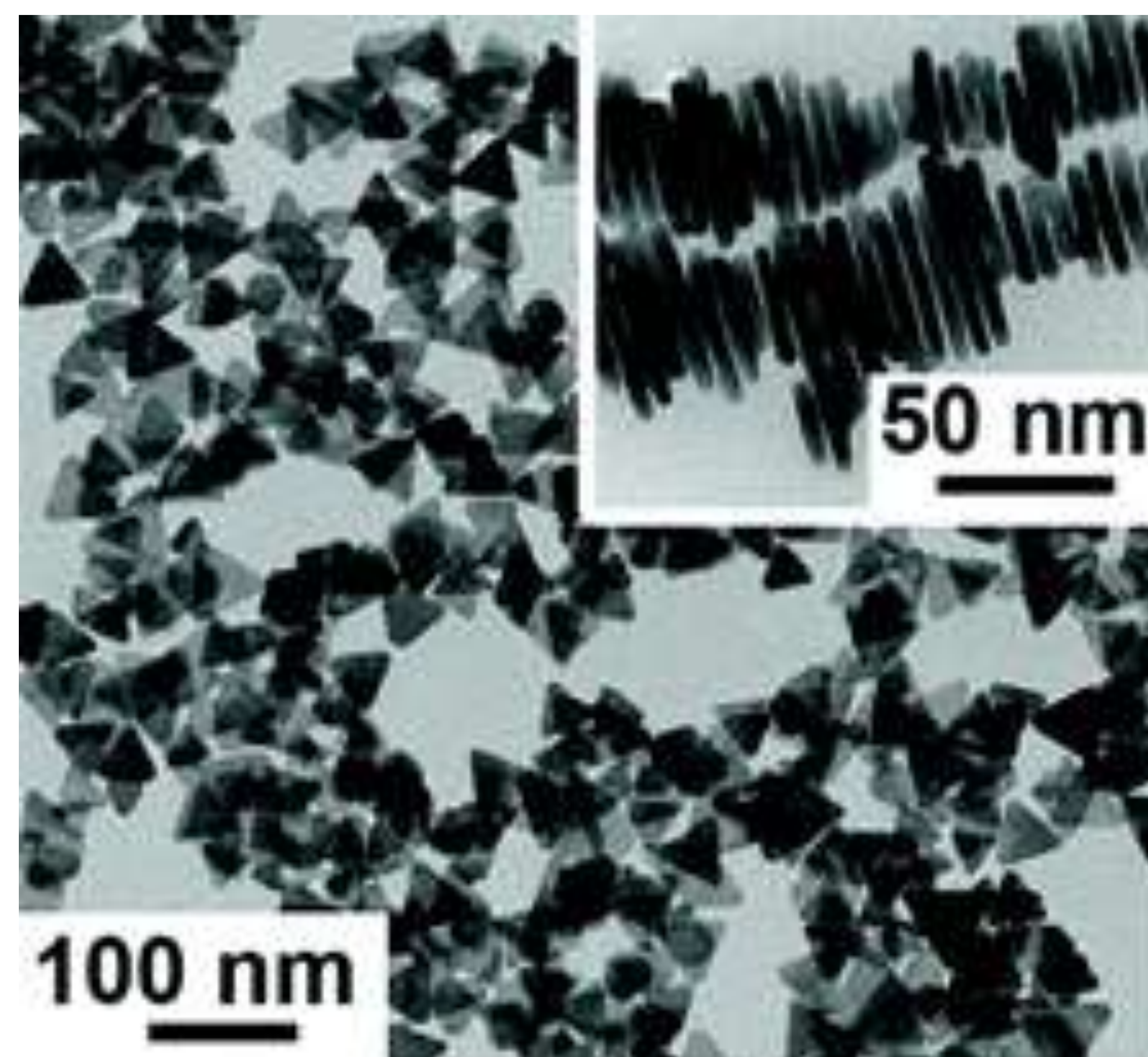
How Silver Nanoplates change throughout the Synthesis:



Time

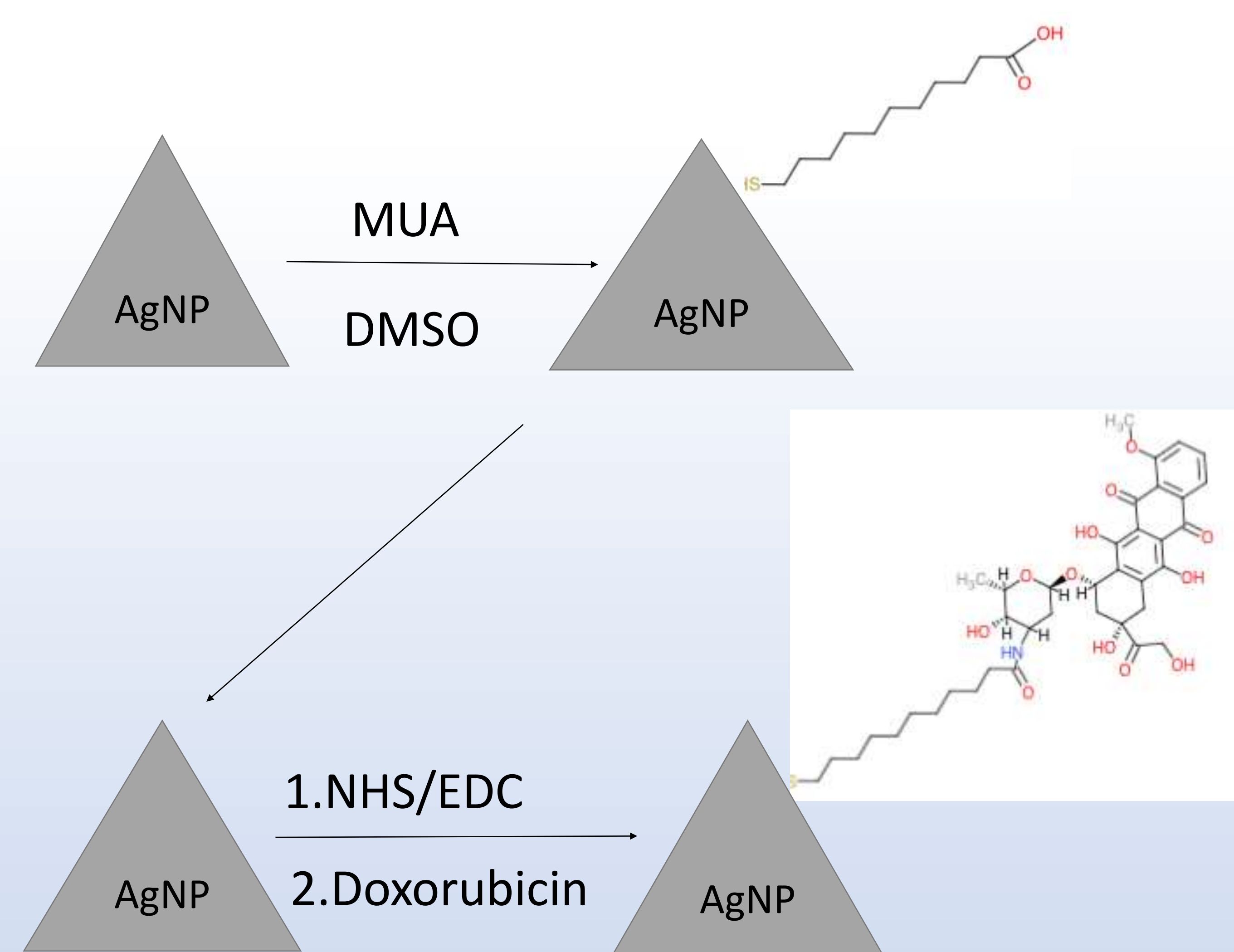


TEM Images of Ag Nanoplates:

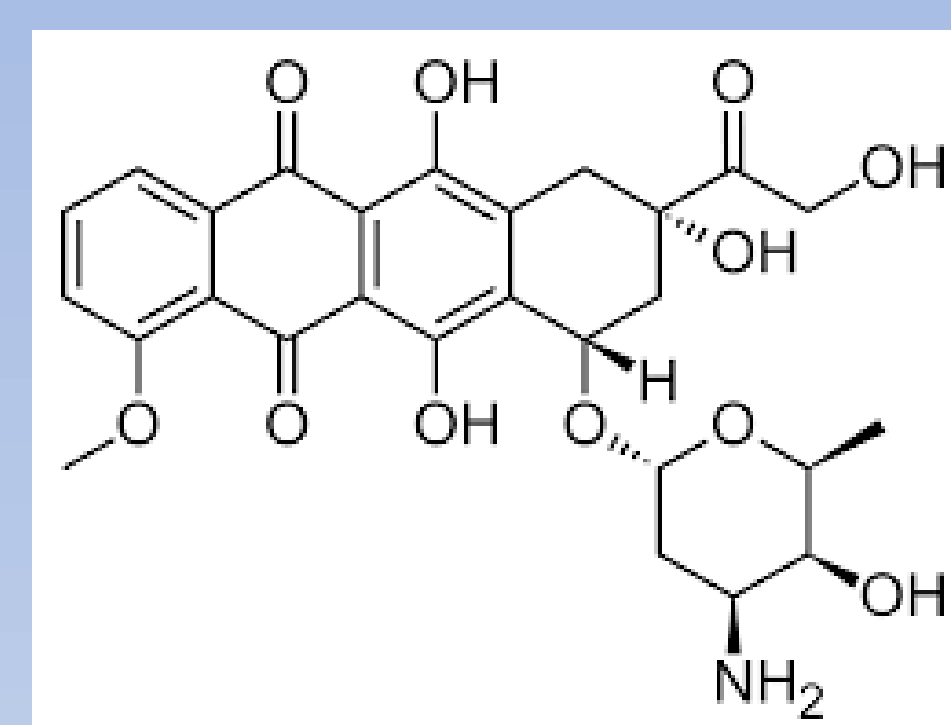


J. Am. Chem. Soc. 2011, 133, 46, 18931–18939

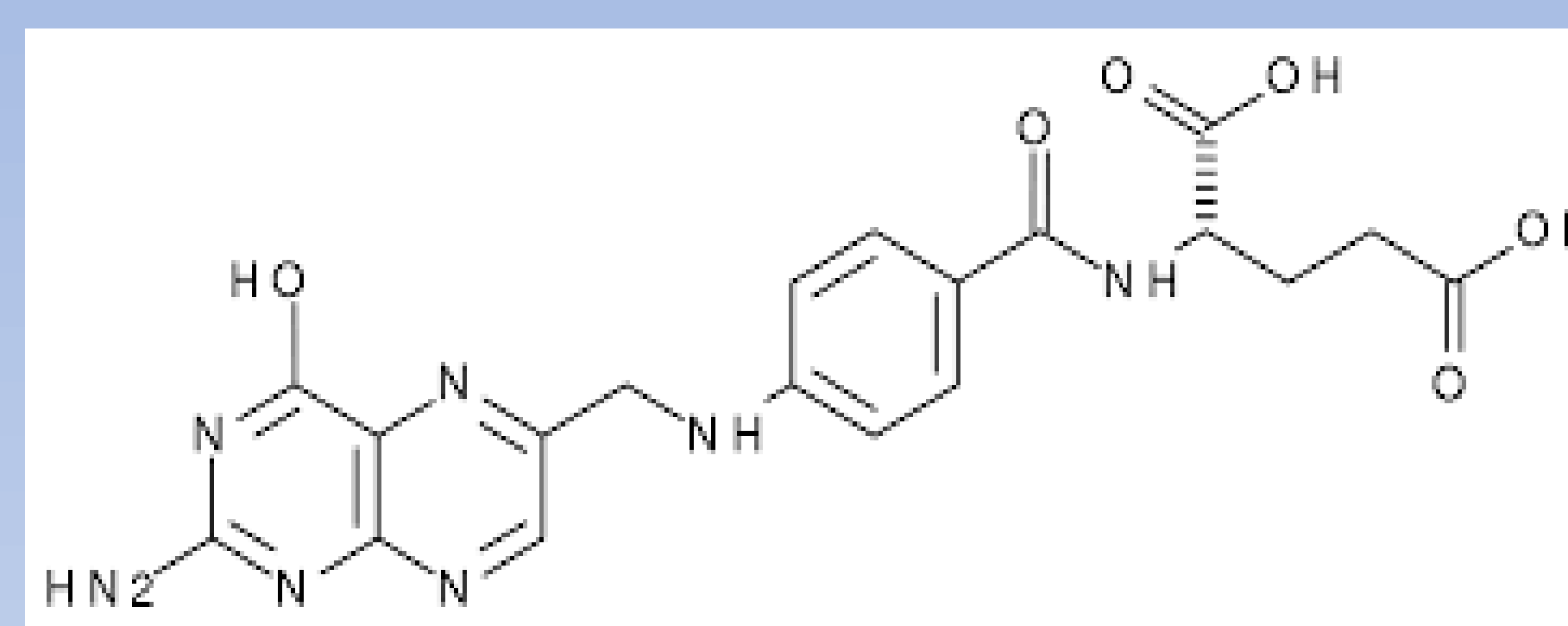
Functionalization Mechanism



MUA: 11-Mercaptoundecanoic acid
 EDC: 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide
 NHS: N-Hydroxysuccinimide



Doxorubicin

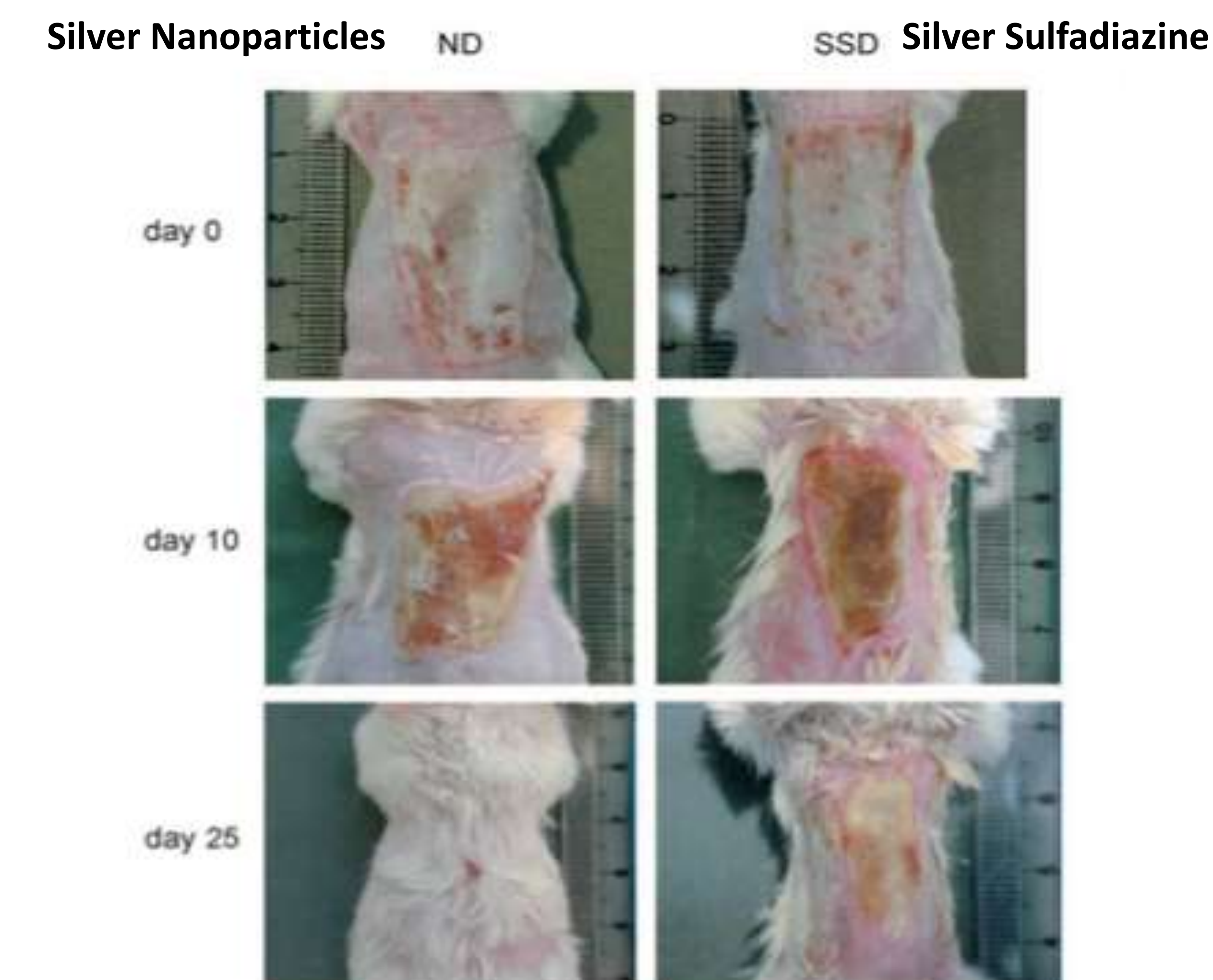


Folic Acid

Applications

- Medical Device disinfectant
- Anti-Bacterial
- Water Treatment
- Incorporated into textile fabric fibers
- Food Storage
- Health industry
- Wound dressing

Benefits of using Silver Nanoparticles in Wound Treatment



ChemMedChem 2007, 2 (1), 129–136.

Results

Using a process found through trial-and-error Silver nanoplates were successfully synthesized. This process was repeated multiple times and each time successful, this can be seen by the final blue colored solution. This color indicates the proper shape/size of Silver nanoparticle desired (Silver nanoplates). The desired use of these Ag Nanoplates is to act as nano carrier in targeted drug delivery. They will carry an anti-cancer therapy drug known as Doxorubicin. Dox was chosen because of its ability to avoid cardiotoxicity. The Ag Nanoplates will also acts as a carrier for folic acid. Folic acid is used also for target drug delivery. Chosen for its ability to bind to cancer cells. This is due to the cancer cells having over expressed folic acid receptors on their surface, allowing for binding only to cancer cells.

Conclusion:

After successfully synthesizing Ag nanoplates, the next direction being taken is to biofunctionalize the Silver Nanoplates. Then, attach anti-cancer therapy drugs to their surface via the use of amide bond formation. This is for biomedical applications.

References

- Tian, Jun et al. *ChemMedChem* vol. 2,1 (2007): 129-36. doi:10.1002/cmdc.200600171
J. Am. Chem. Soc. 2011, 133, 46, 18931–18939
 Beyene, H. D., Werkneh, A. A., Bezabh, H. K., & Ambaye, T. G. (2017), 13, 18–23. 10.1016/j.susmat.2017.08.001