Application of Nanoparticulate Conducting Polyaniline in Nanofilm Biosensor Technology

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Aniline/PVS vs. Polyaniline/DBSA

Traditional Technique

Starting Material: Carcenogenic Monomer (aniline)

Deposition Technique: Electropolymerisation

Novel Technique

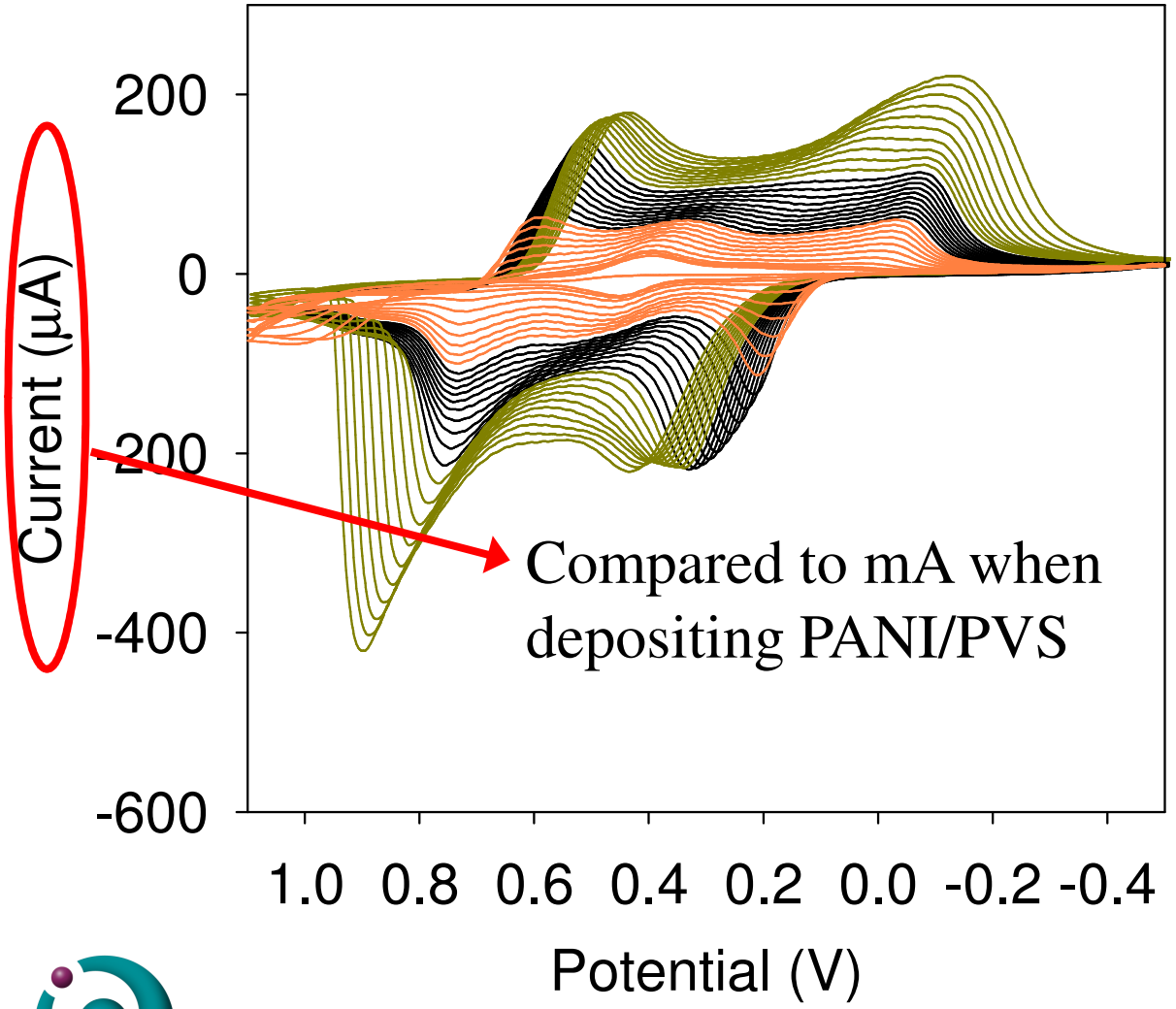
Starting Material: Polymer Nanoparticles

Deposition Techniques: Electrodeposition Drop-Coating

Theoretical Advantages of Polyaniline/DBSA:

- ✓ Better Processibility
- ✓ Higher Conductivity in Aqueous Media
- ✓ Nanoscale Sensor Fabrication
- ✓ ……..

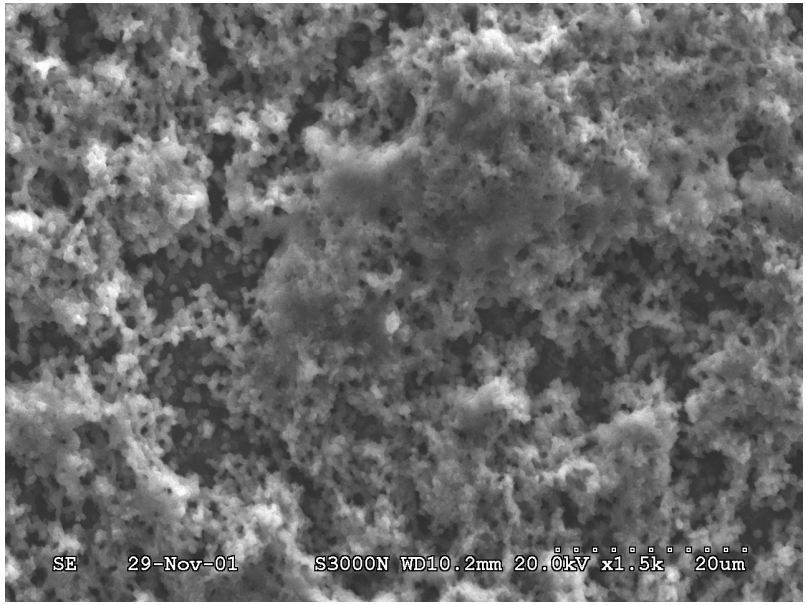
Characterisation of PANI/DBSA



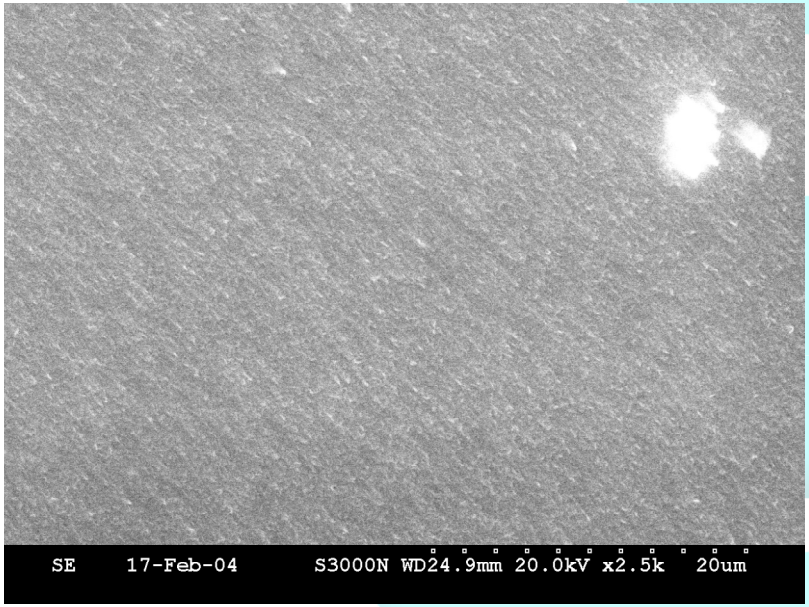
Film Thicknesses:
PANI/PVS ~ 35 µm
PANI/DBSA ~ 350 nm

SEM Studies

PANI/PVS

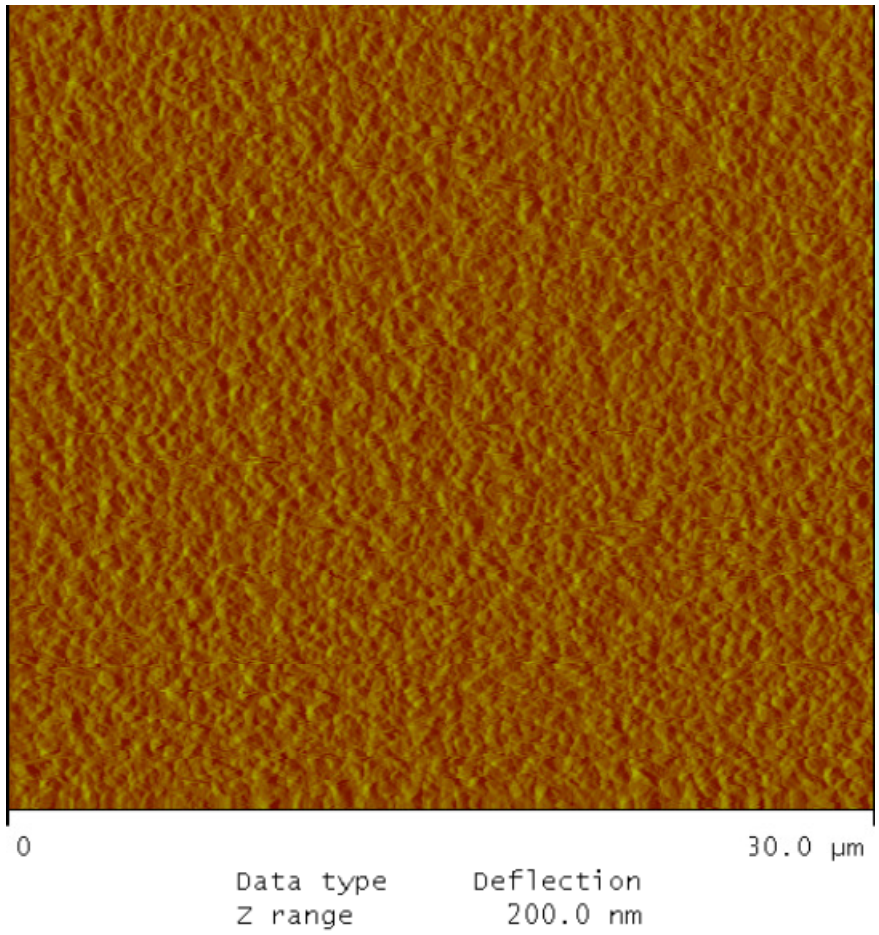


PANI/DBSA Nanoparticles

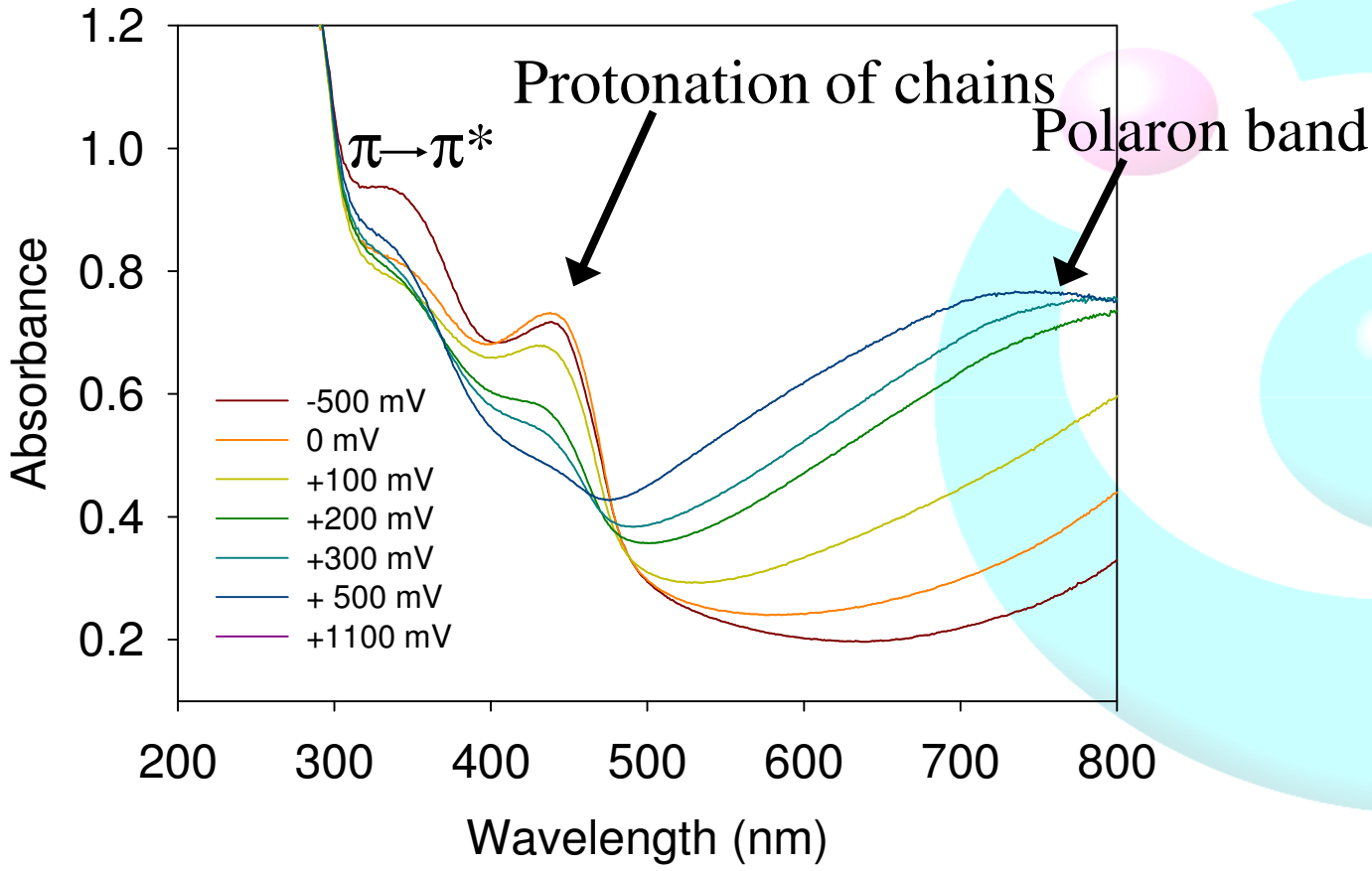


Drastically smoother film

AFM Studies of PANI/DBSA Nanoparticles

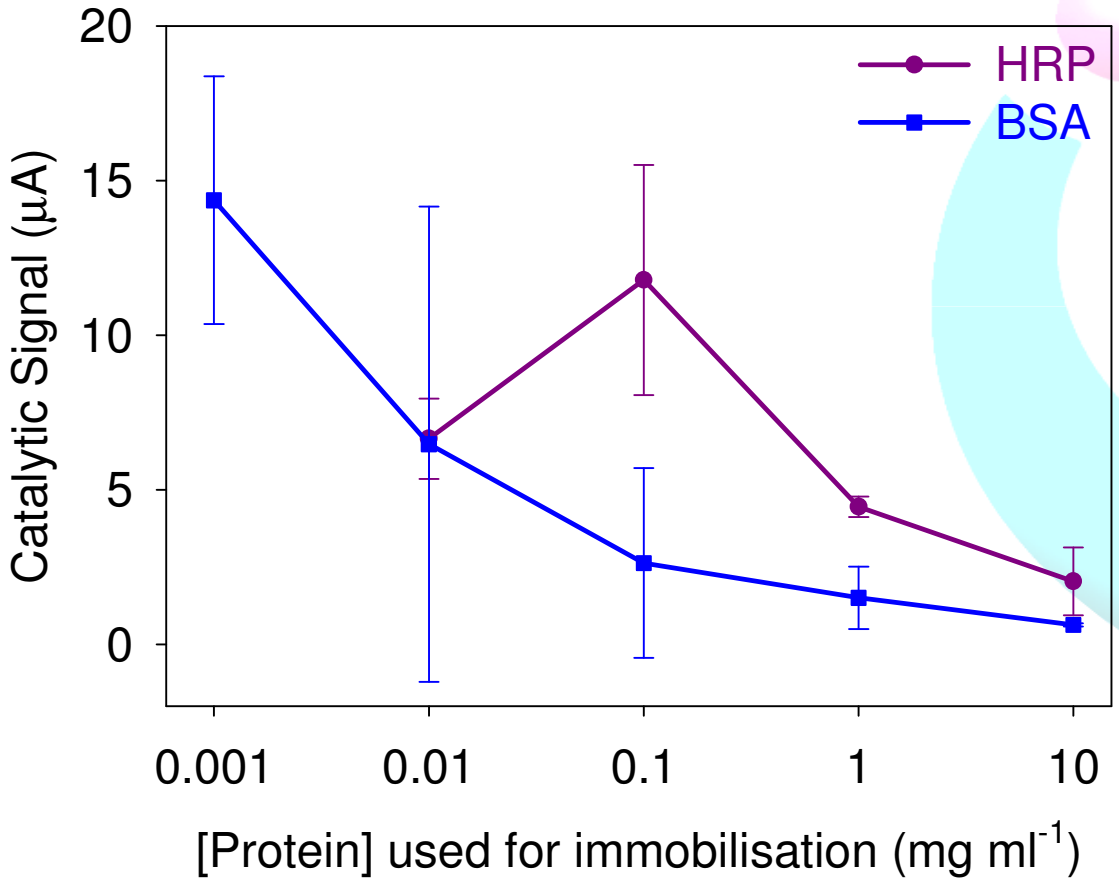


Spectroelectrochemistry of PANI/DBSA

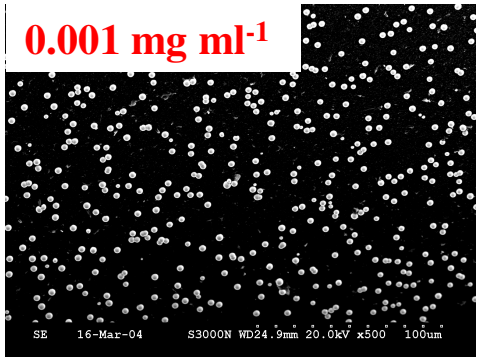


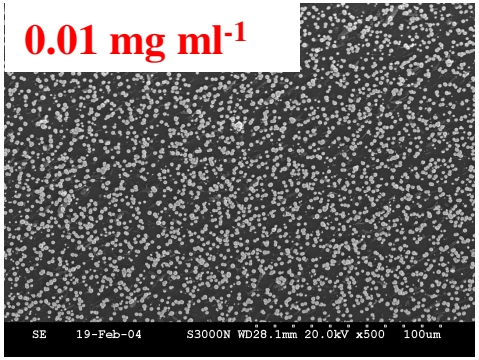
PANI-DBSA used in HRP Biosensor

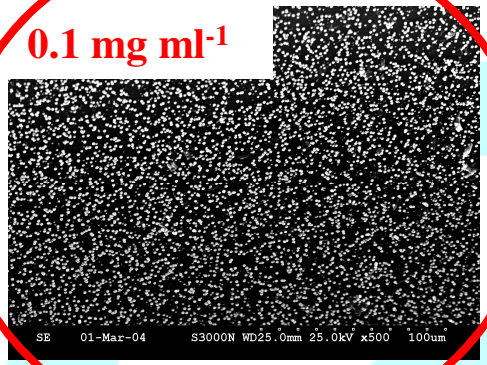
Dependence of H_2O_2 (8 mM) response on [HRP] and [BSA] electrostatically immobilised onto PANI-DBSA surface



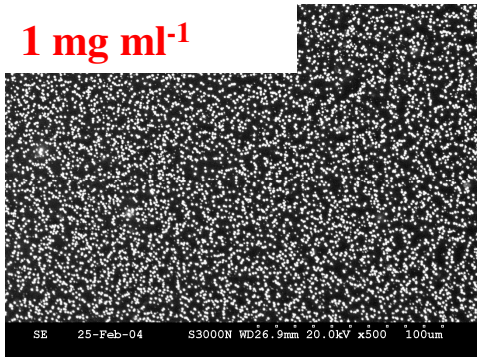
SEM studies of protein on PANI-DBSA

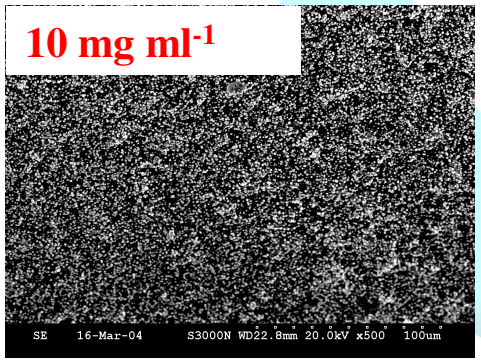






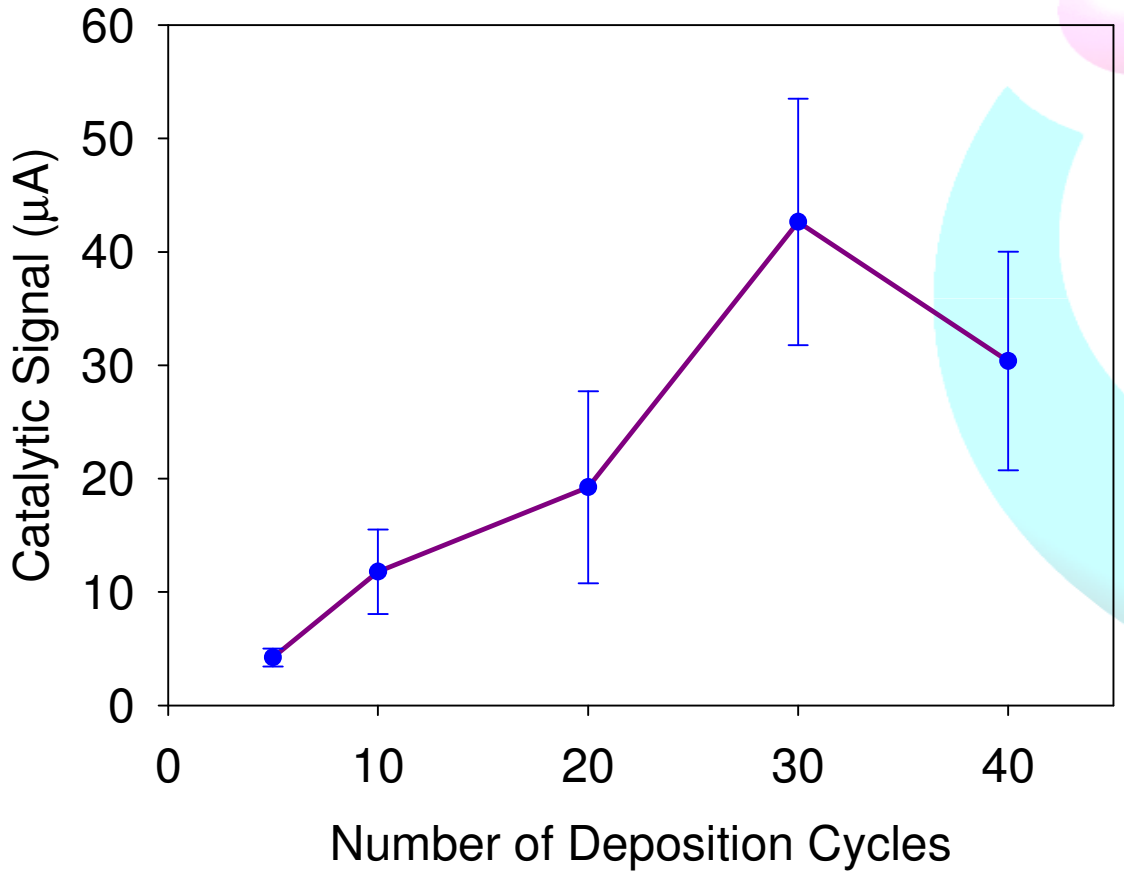
Optimum





PANI-DBSA used in HRP Biosensor

Dependence of H_2O_2 (8 mM) response on number of deposition cycles of PANI-DBSA



Peroxide Biosensor Comparison & Conclusions

	PANI/PVS Biosensor	PANI/DBSA Biosensor
Signal:	71 ± 14 µA	42 ± 11 µA
S/N:	17 ± 4	61 ± 13
Response Time:	9.46 ± 4.12 s	0.62 ± 0.04 s
Optimal [Protein]:	0.66 mg ml^{-1}	0.1 mg ml^{-1}

- PANI/DBSA performs well in a biosensor format as an electrodeposited film.
- Work is ongoing to develop a printable sensor using these nanoparticles.