# Preparation and Optimization of Localized Surface Plasmon Resonance (LSPR) Transducers for the Study of Carbohydrate–Protein Interactions

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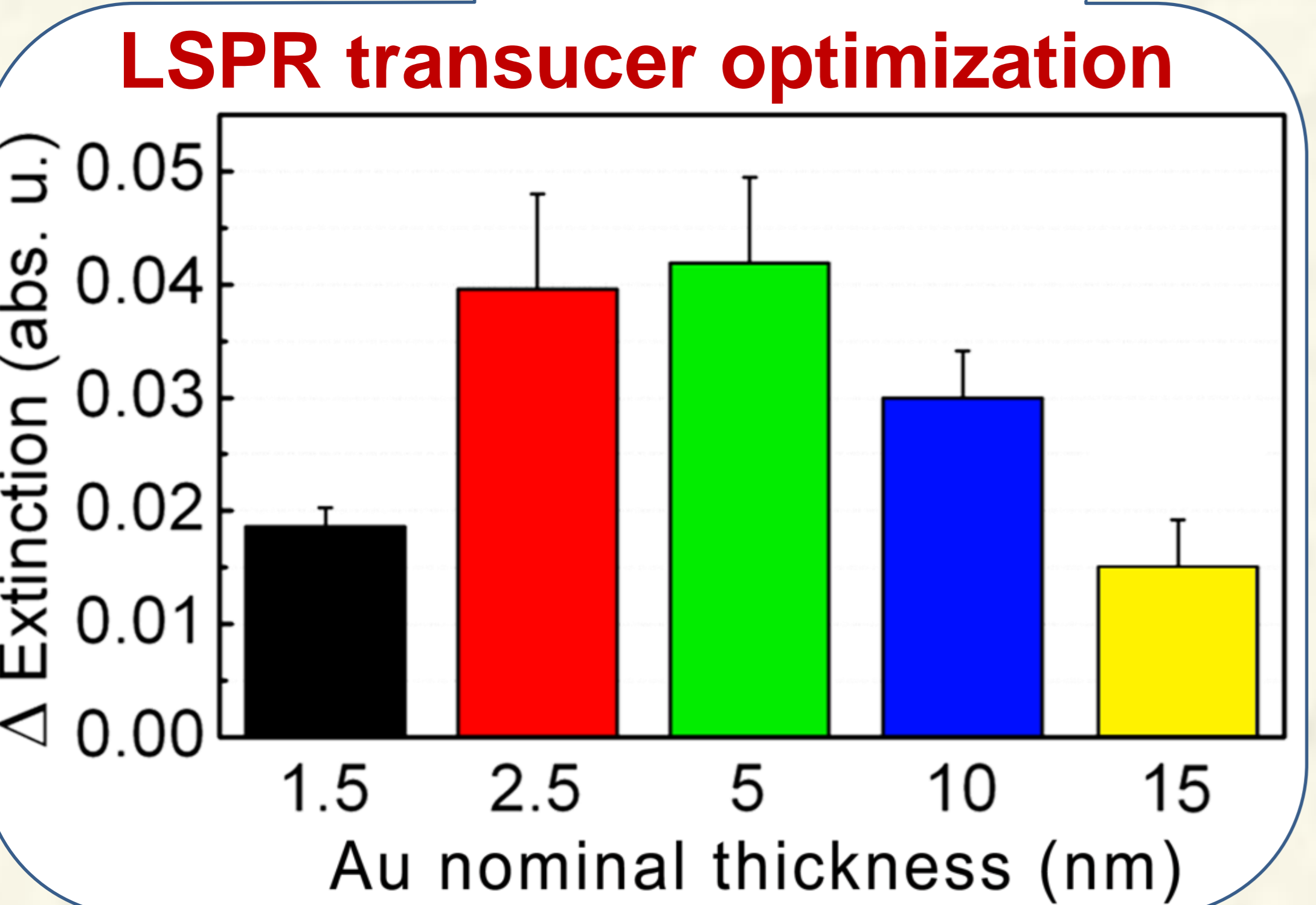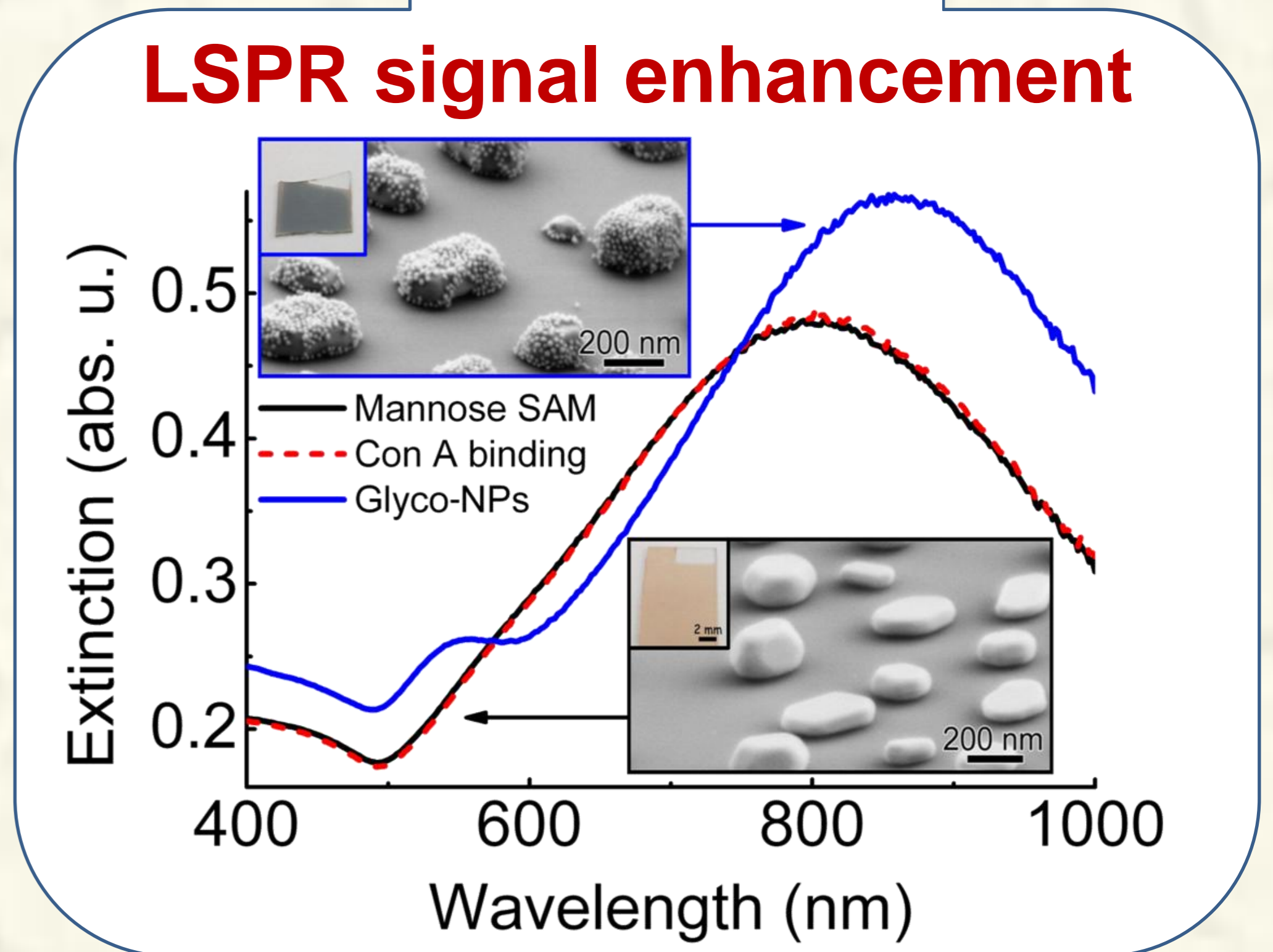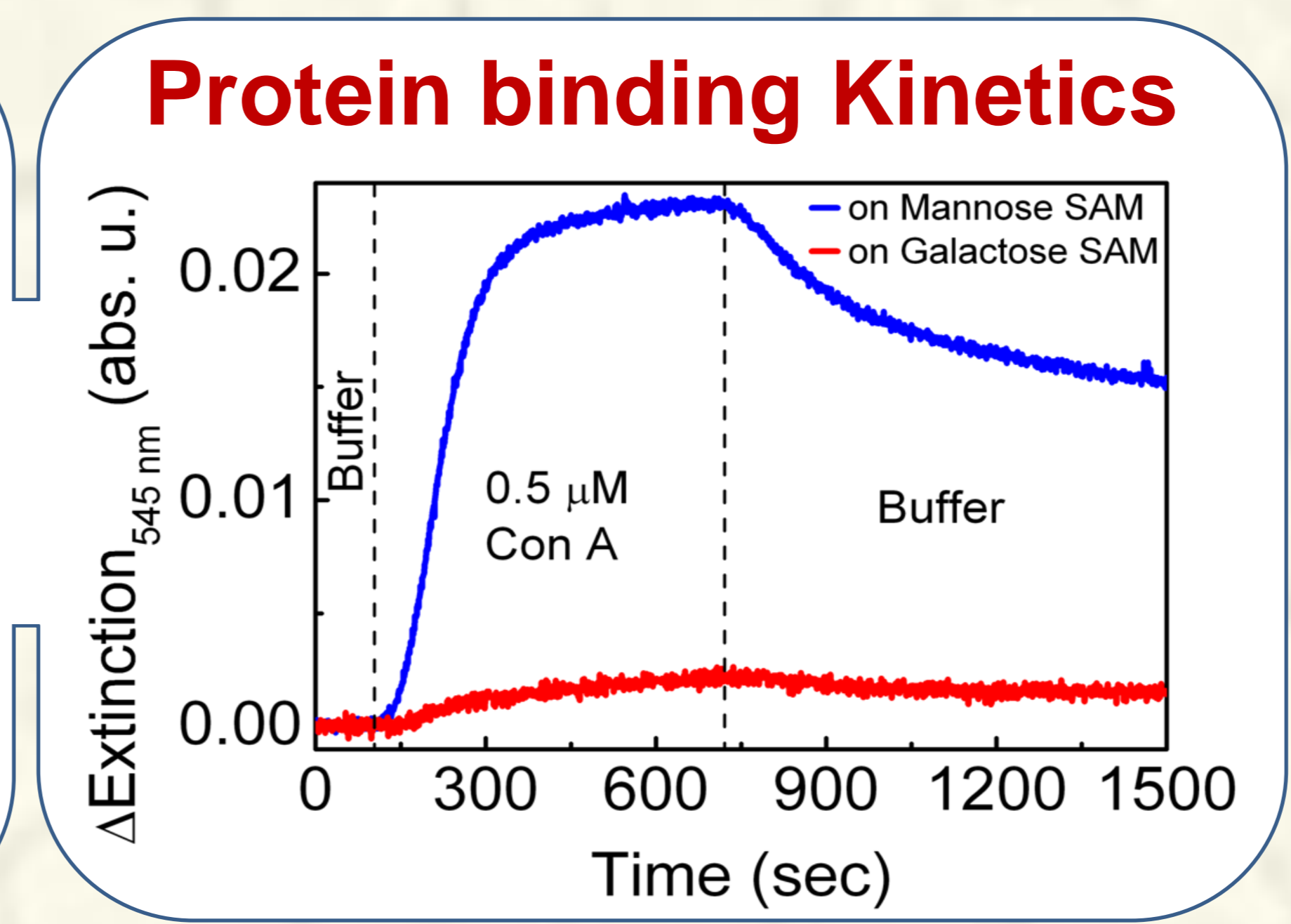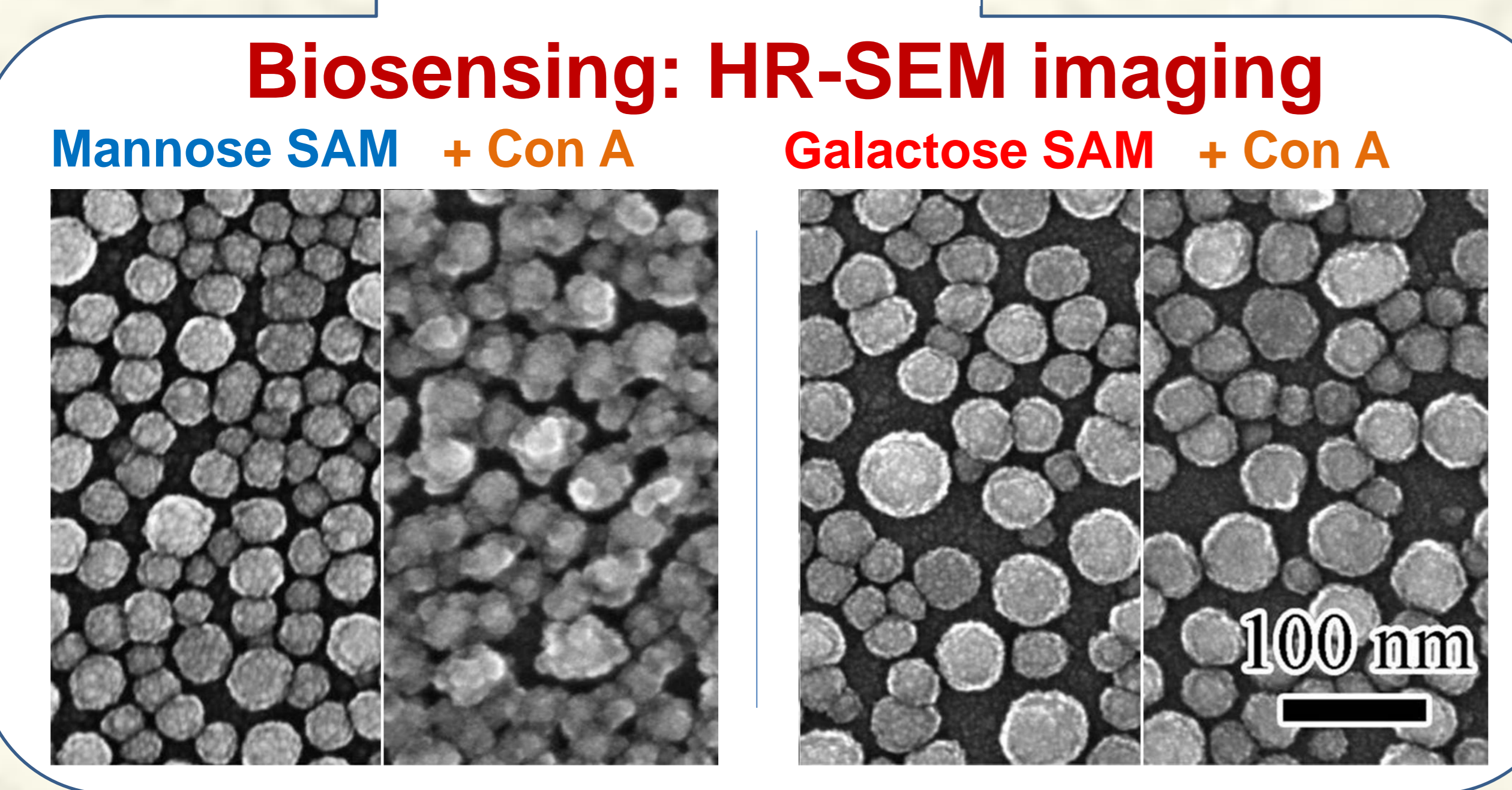Peter H. Seeberger,[2,3] Alexander Vaskevich,[1] Israel Rubinstein[1]

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**Introduction:** Ultrathin gold island films prepared by evaporation on glass slides and annealing, combined with synthetically-modified carbohydrates, were used to develop localized surface plasmon resonance (LSPR) transducers for monitoring and imaging protein–carbohydrate in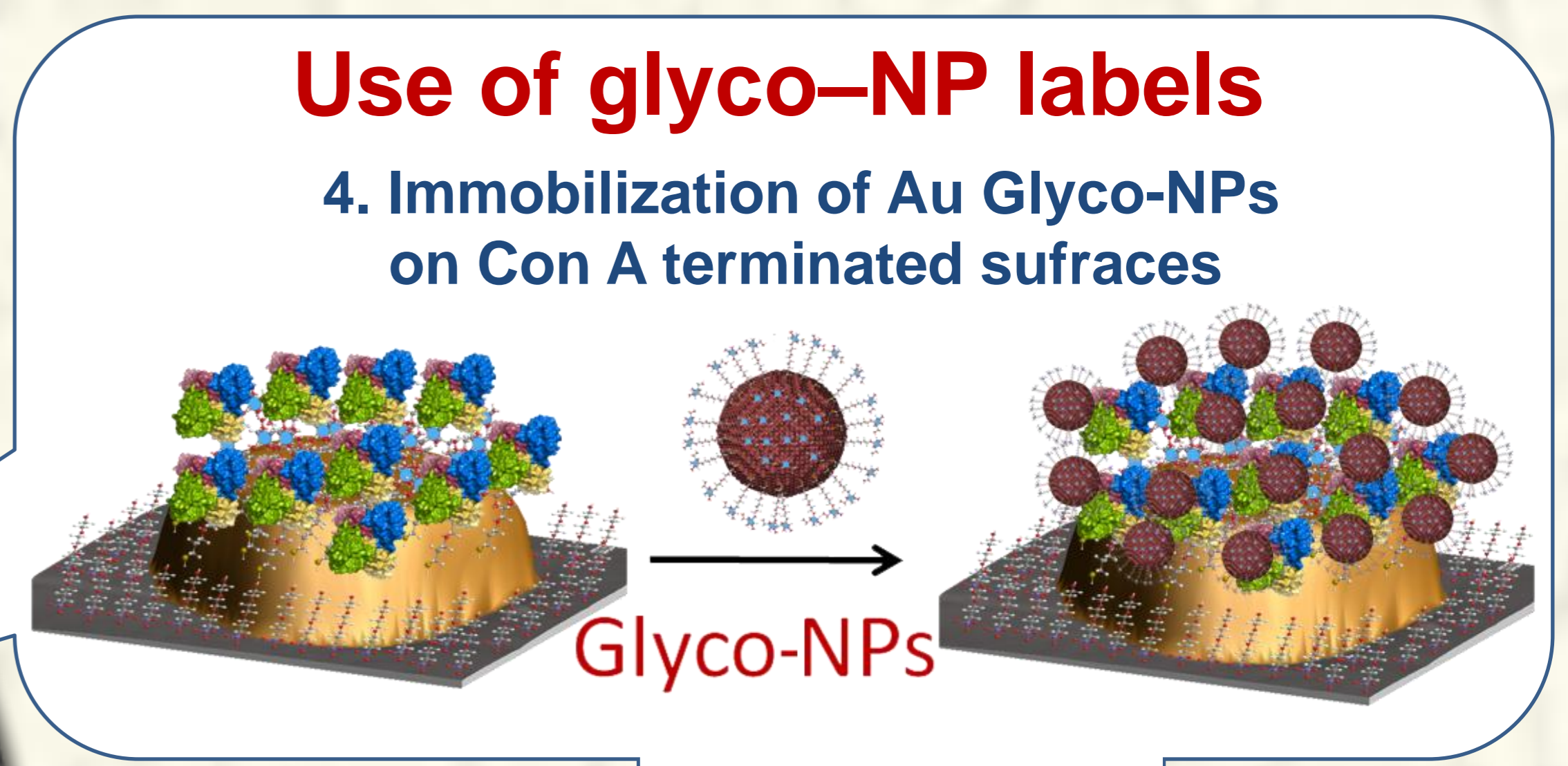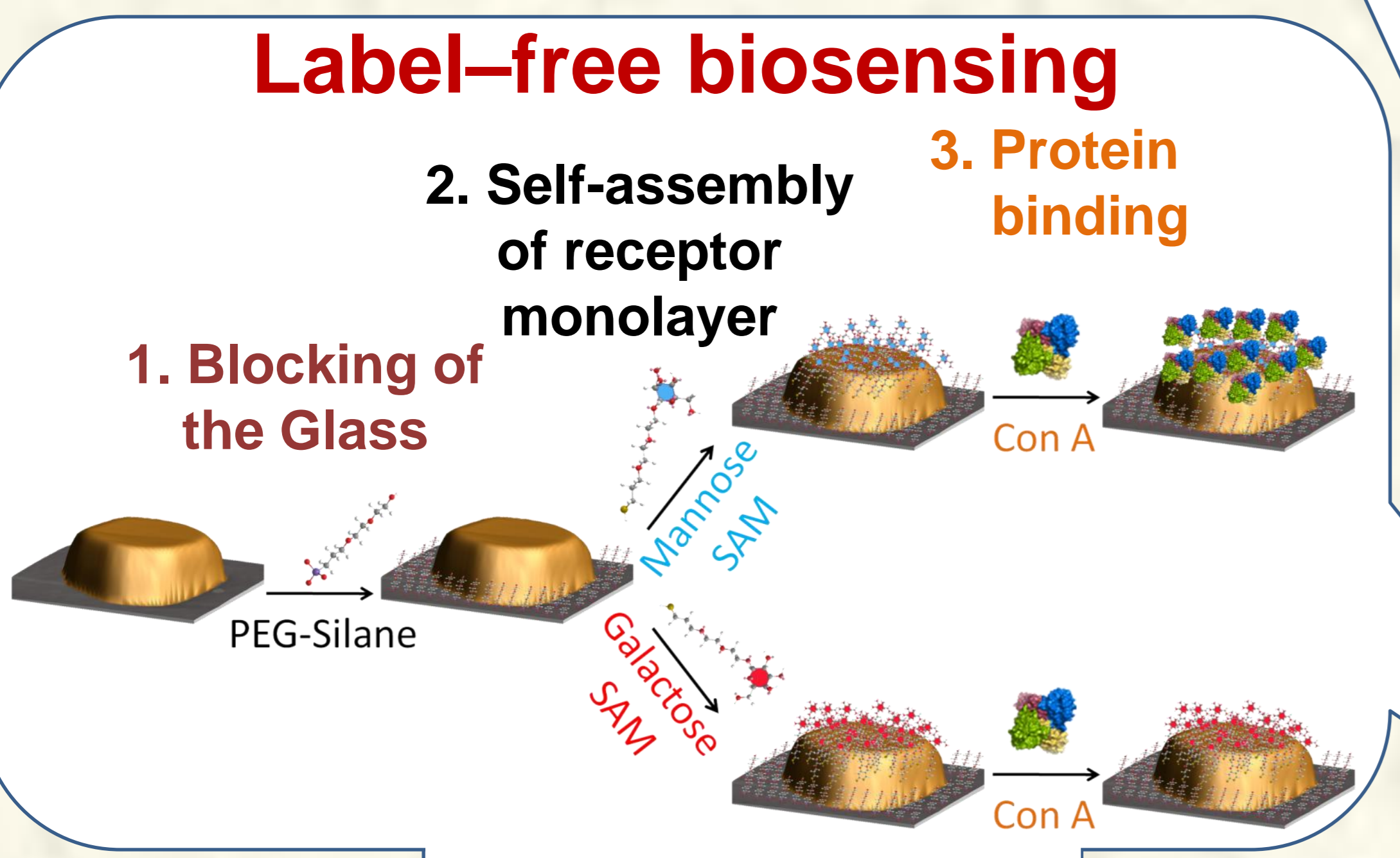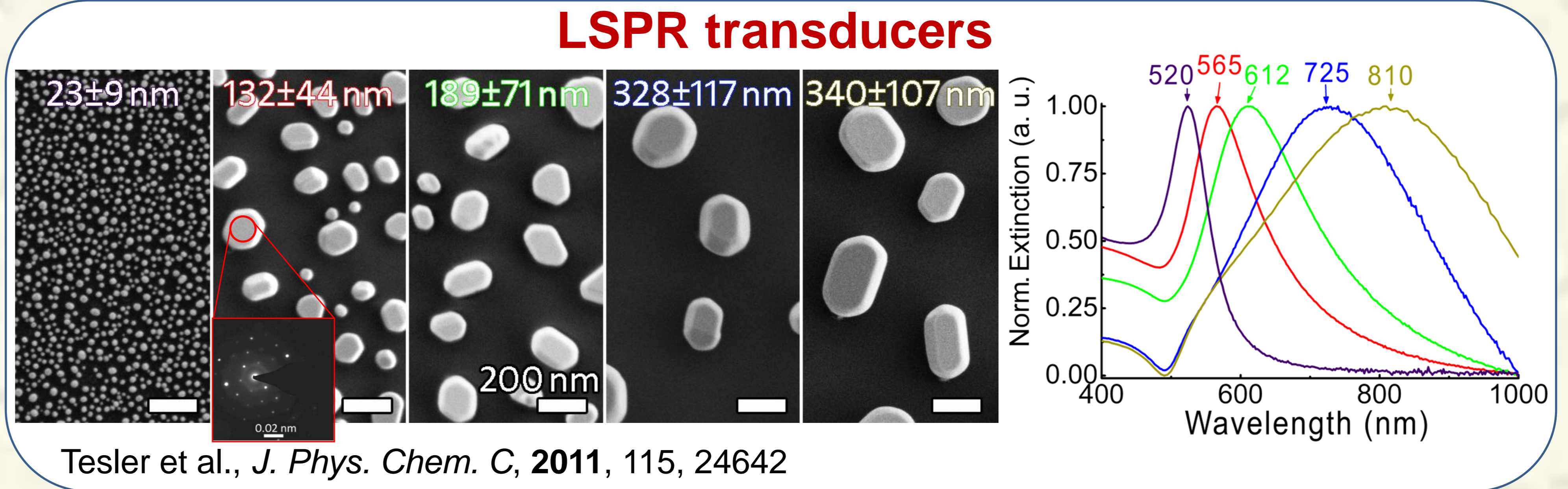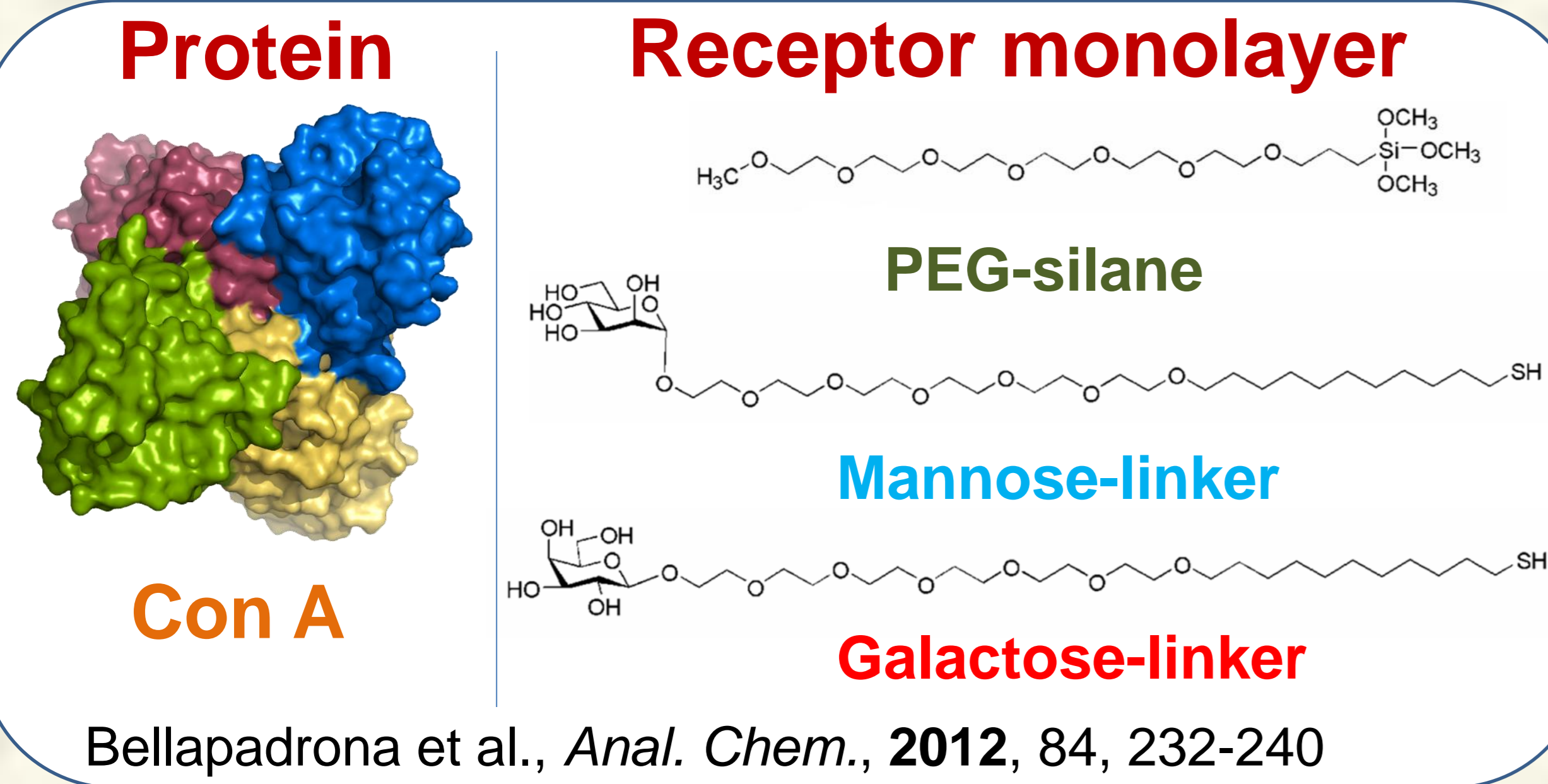teractions. Tuning of the surface plasmon band position enabled optimization of the LSPR transducer response. Specific recognition of mannose by Concanavalin A (Con A) is presented as a model of biological sensing, using stationary and dynamic configurations. Signal amplification and improved detection limit were achieved using mannose–modified Au nanoparticles (glyco-NPs).

## Protein

Con A

## Receptor monolayer

PEG-silane
Mannose-linker
Galactose-linker

Bellapadrona et al., *Anal. Chem.*, **2012**, 84, 232-240

## LSPR transducers

23±9 nm    132±44 nm    189±71 nm    328±117 nm    340±107 nm    200 nm

520 565 612 725 810

Tesler et al., *J. Phys. Chem. C*, **2011**, 115, 24642

## Label–free biosensing

1. Blocking of the Glass
2. Self-assembly of receptor monolayer
3. Protein binding

PEG-Silane
Mannose SAM
Galactose SAM
Con A

## Use of glyco–NP labels

4. Immobilization of Au Glyco-NPs on Con A terminated surfaces

Glyco-NPs

## Au Glyco-NPs

520

20 nm

## Biosensing: LSPR results

PEG-silane
Mannose SAM
1 µM Con A

PEG-silane
Galactose SAM
1 µM Con A

## Biosensing: HR-SEM imaging

Mannose SAM    + Con A        Galactose SAM    + Con A

100 nm

## Protein binding Kinetics

on Mannose SAM
on Galactose SAM

Buffer
0.5 µM Con A
Buffer

## LSPR signal enhancement

Mannose SAM
Con A binding
Glyco-NPs

200 nm
200 nm

## LSPR transucer optimization

## Summary

✓ Simple preparation and optimization of LSPR tranducers

✓ Highly specific response

✓ Determination of kinetic parameters

✓ Low detection limit

## Improvement of the detection limit

1.5 µM BSA + Con A
with Glyco-NPs

No Con A    5 nM Con A    50 nM Con A    500 nM Con A

(A)    (B)    (C)    (D)

A    B    C    D

100 nm