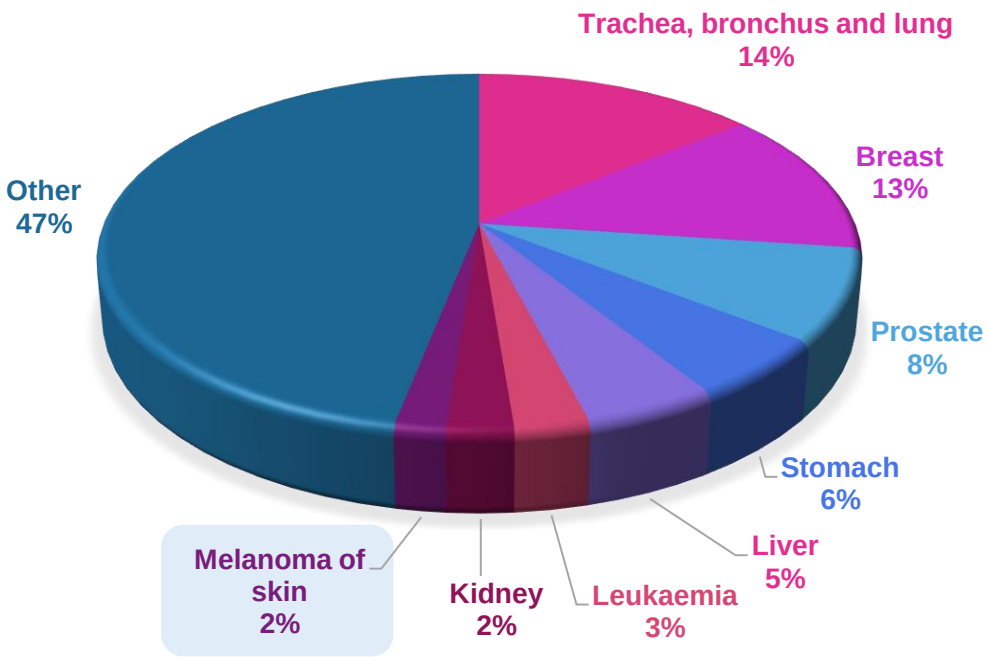
Plasmonic Nanohybrids for Vectorization and Delivery of Antisense Oligonucleotides in Metastatic Melanoma Models

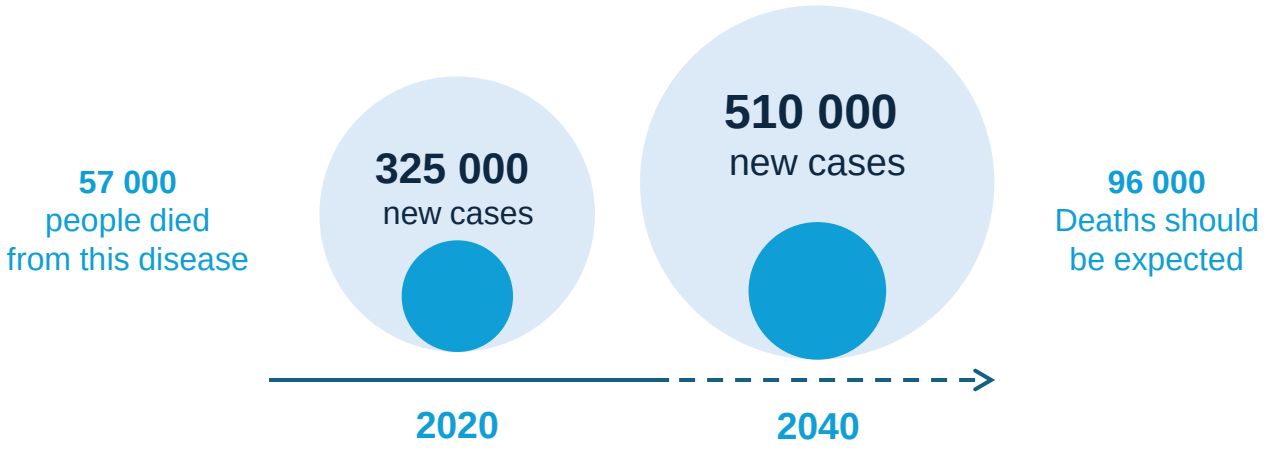
Lola Blayac
Supervisors : Souhir Boujday & Guilhem Bousquet
Co-supervisors : Anne Vallée, Michèle Salmain & Bruno Palpant

Melanoma Cancer: Global Impact and Future Trends

Global Cancer impact in 2022 in 185 countries



Skin cancers are the most common group of cancers diagnosed in the world with more than 1.5 million new cases estimated in 2020



World Health Organization

« Global burden of cutaneous melanoma in 2020 and projections to 2040 ». Available on : https://www.iarc.who.int/infographics/global-burden-of-cutaneous-melanoma-in-2020-and-projections-to-2040

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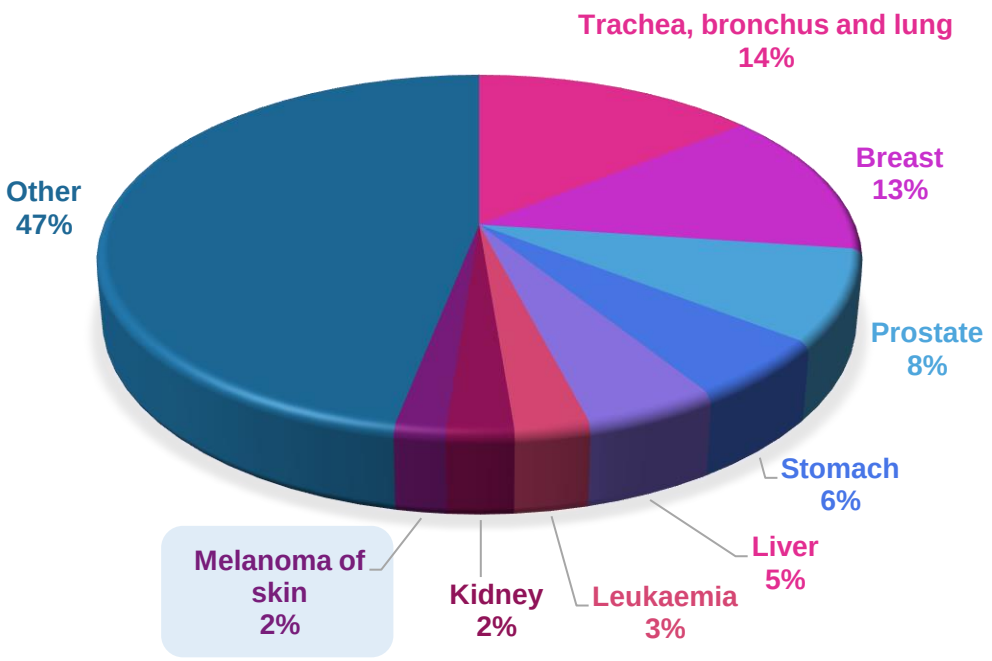

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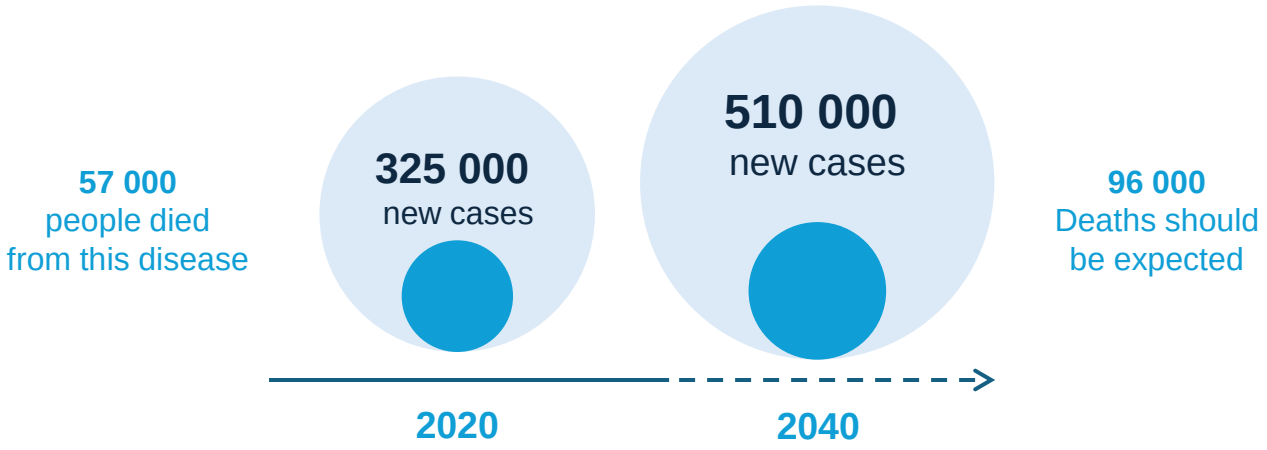

World Health Organization

METASTASIC MELANOMA

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Metastatic Melanoma : Prominin-2 (PROM2)

PROM2, an early biomarker for metastasis

Mw = 100-120 kDa

Paris, Justine, et al. *Clinical and Translational Medicine* 14.3 (2024)

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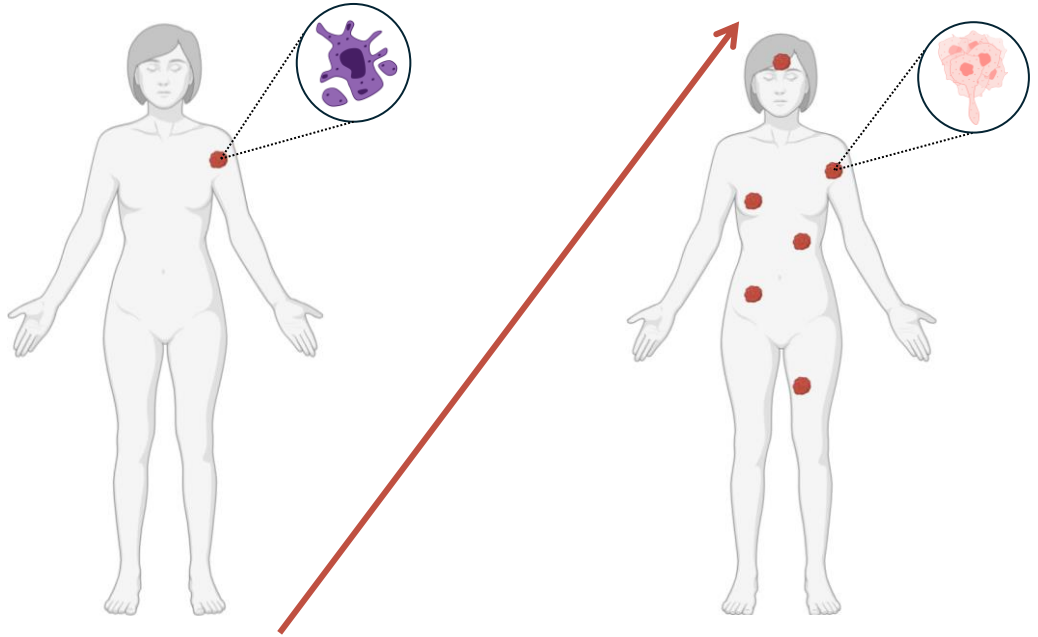
EMT : Epithelial-Mesenchymal Transition

Tumor cell death
No metastasis

Ferroptosis Resistance
EMT ++



Low expression of PROM-2

High expression of PROM-2

Paris, Justine, et al. *Clinical and Translational Medicine* 14.3 (2024)

Metastatic Melanoma : Prominin-2 (PROM2)

PROM2, an early biomarker for metastasis

Mw = 100-120 kDa

Antisens oligonucleotide (ASO) **anti-PROM2** can decrease the expression of the protein and so prevent metastasis

EMT : Epithelial-Mesenchymal Transition

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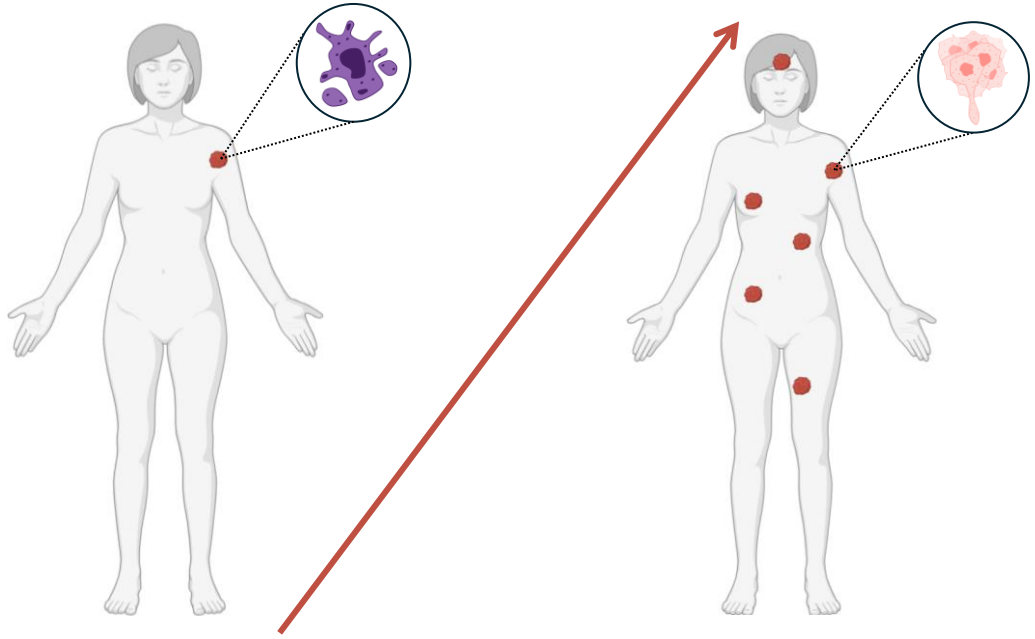


Low expression of PROM-2

High expression of PROM-2

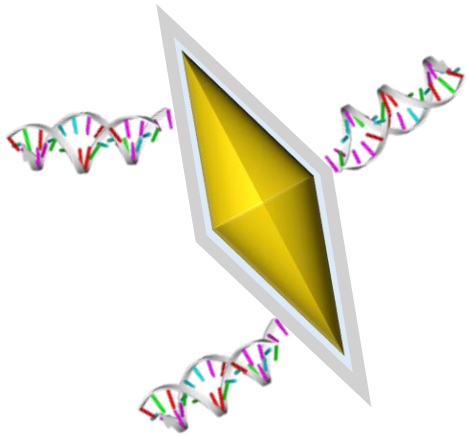
Paris, Justine, et al. *Clinical and Translational Medicine* 14.3 (2024)

Our hybrids nanomaterials

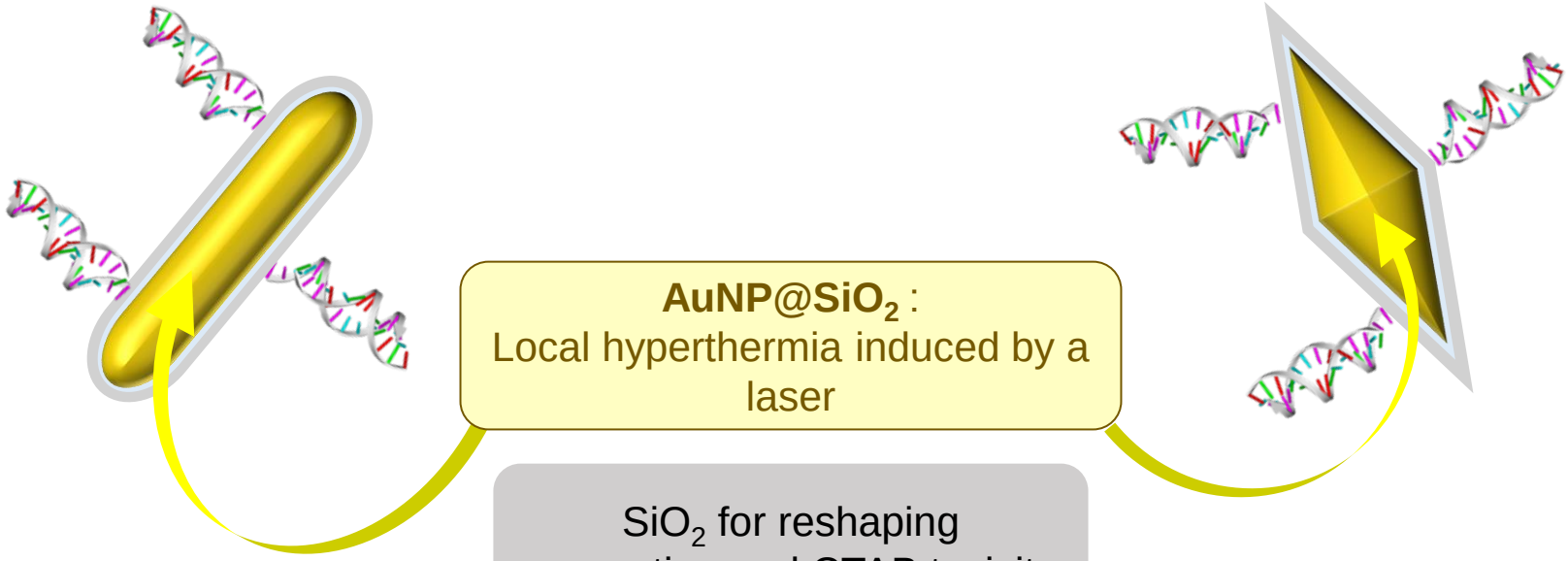
Differents morphologies of hybrids nanomaterials

Cells internalization

Different Hotspot



Our hybrids nanomaterials



AuNP@SiO_2 :
Local hyperthermia induced by a laser

SiO_2 for reshaping
prevention and CTAB toxicity

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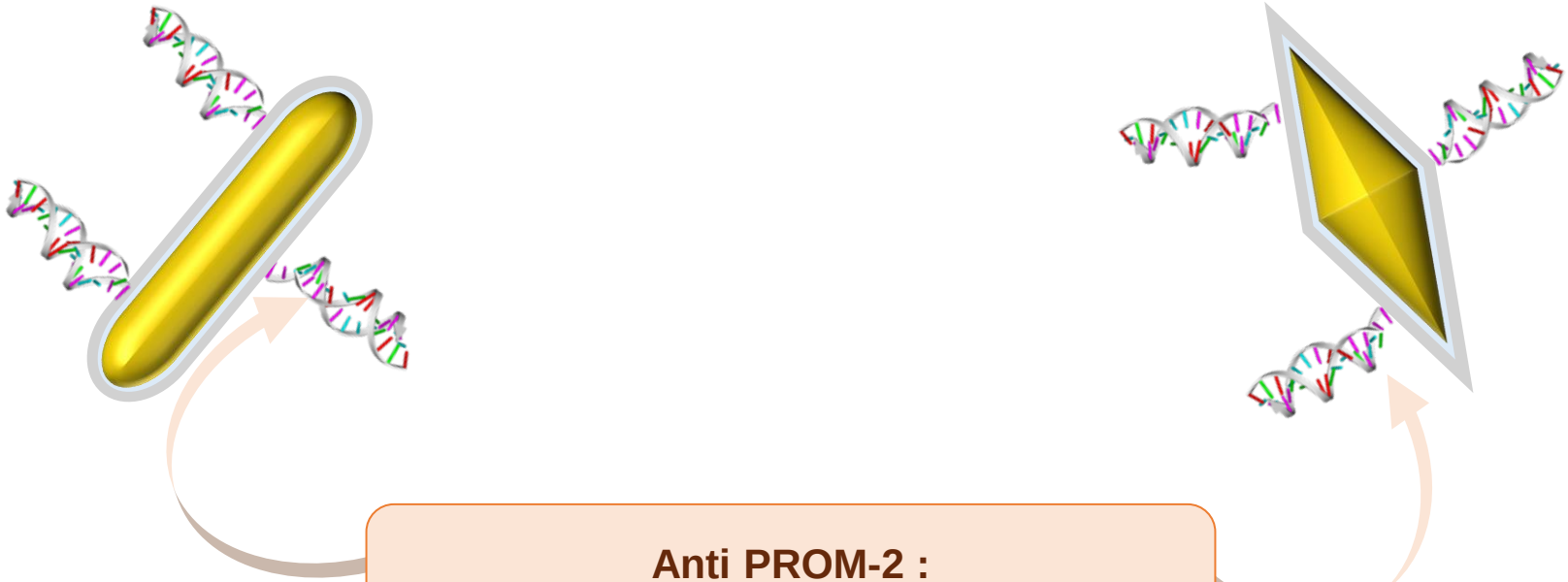
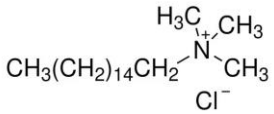
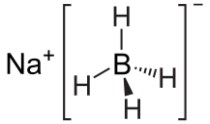


Anti PROM-2 :
inhibition of the PROM-2 transcription

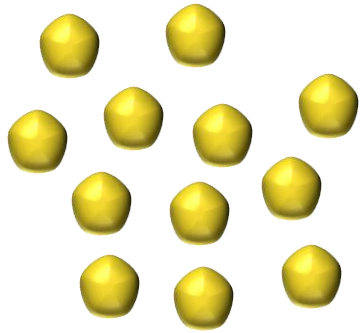
AuBP synthesis



CTAC
+
Citric Acid
+
$HAuCl_4$

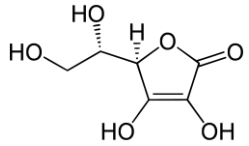


$NaBH_4$

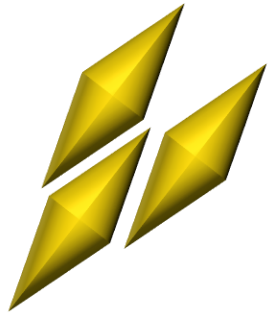


Pentatwinned gold seeds

CTAB,
$AgNO_3$, $HAuCl_4$
30°C



Ascorbic Acid



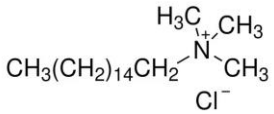
AuBP@CTAB

Seeds

Growth

Sánchez-Iglesias, Ana, et al. *Journal of the American Chemical Society* 139.1 (2017)

AuBP synthesis



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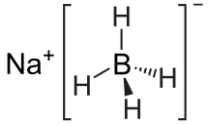

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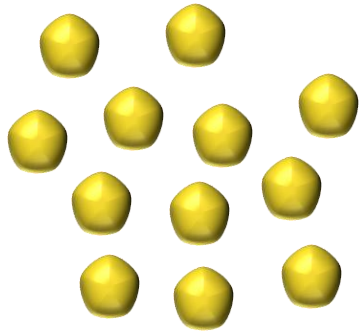

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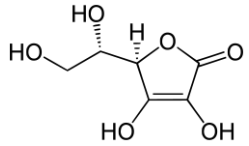

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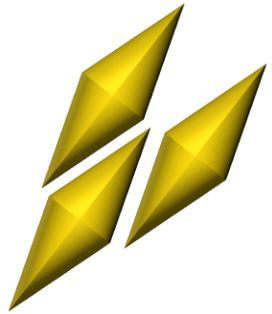

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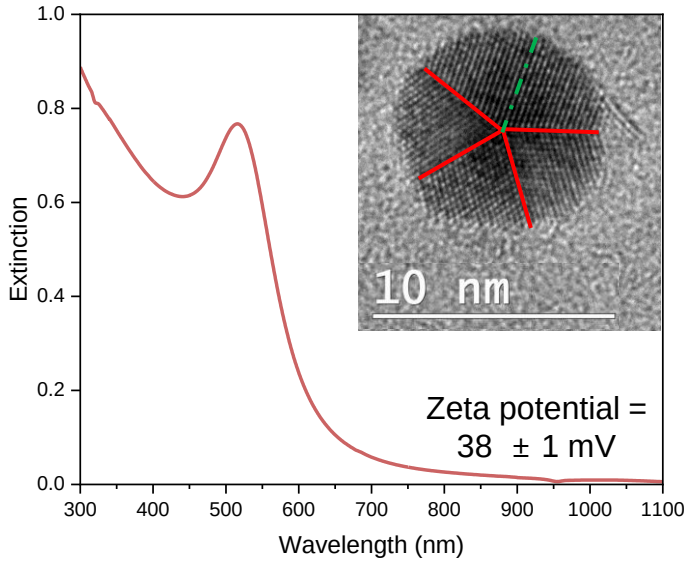

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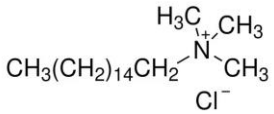

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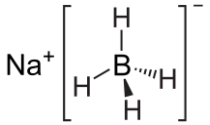

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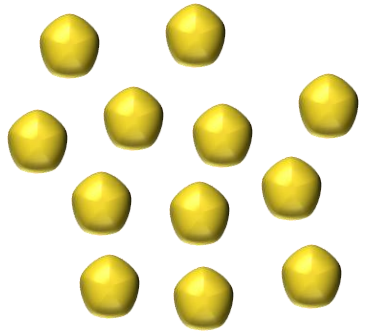

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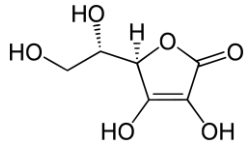

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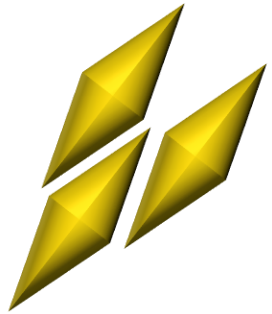

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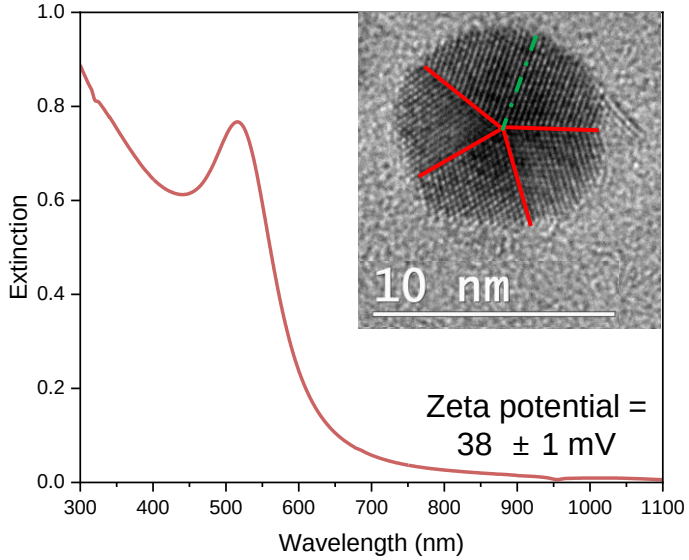

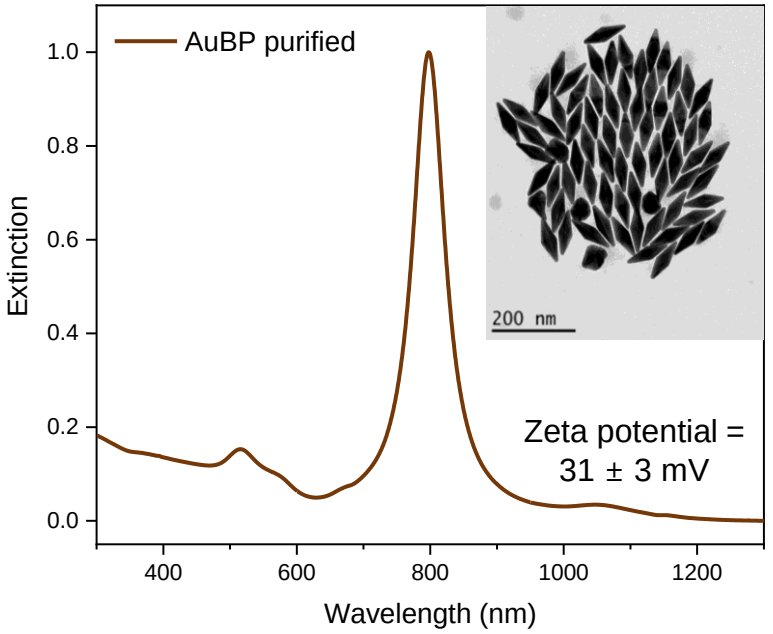

Synthesis Pathway

Pellas, Vincent, et al. *ACS Applied Nano Materials* 4.9 (2021)

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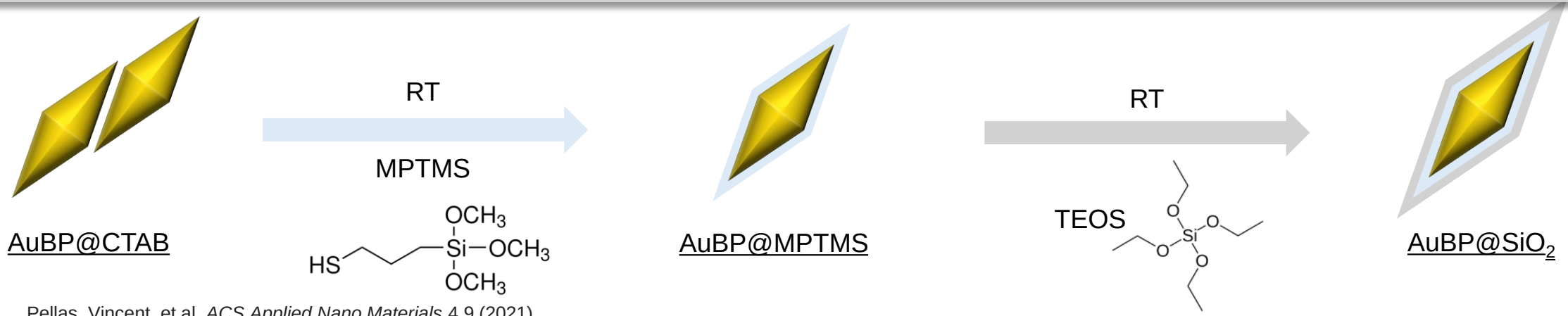

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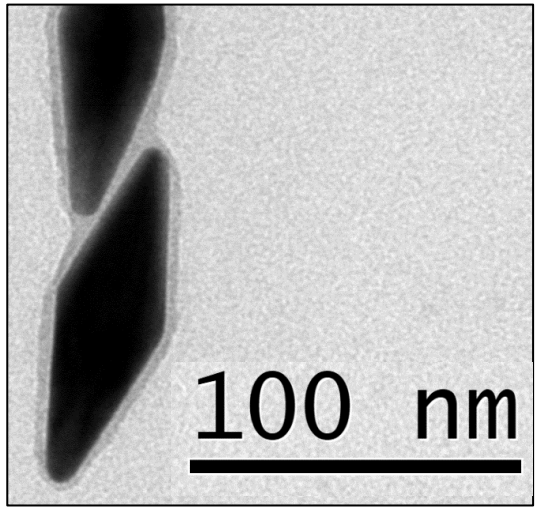
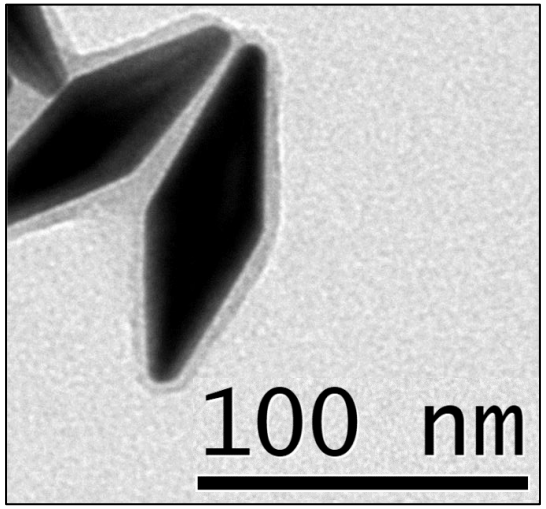
Ratio Au/TEOS : 1/0.9



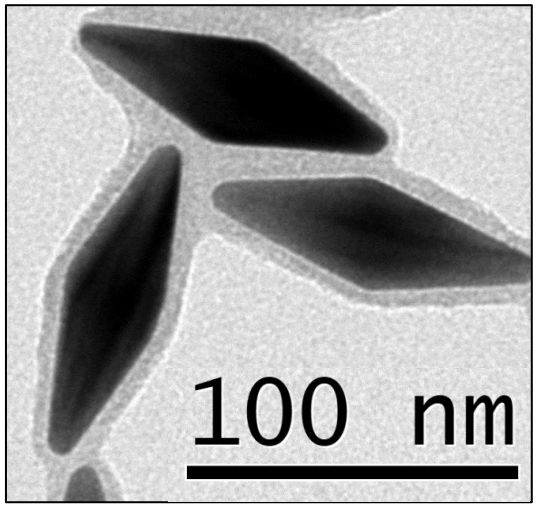
Silica thickness : 3.7 ± 0.7 nm

Ratio Au/TEOS : 1/1.8



Silica thickness : 4.4±1.0 nm

Ratio Au/TEOS : 1/3.6



Silica thickness : 6.8± 1.3 nm

Thank you for your attention,

See you at my poster !!