

# HYBRID SUPERHYDROPHOBIC COATINGS USING A GREEN APPROACH

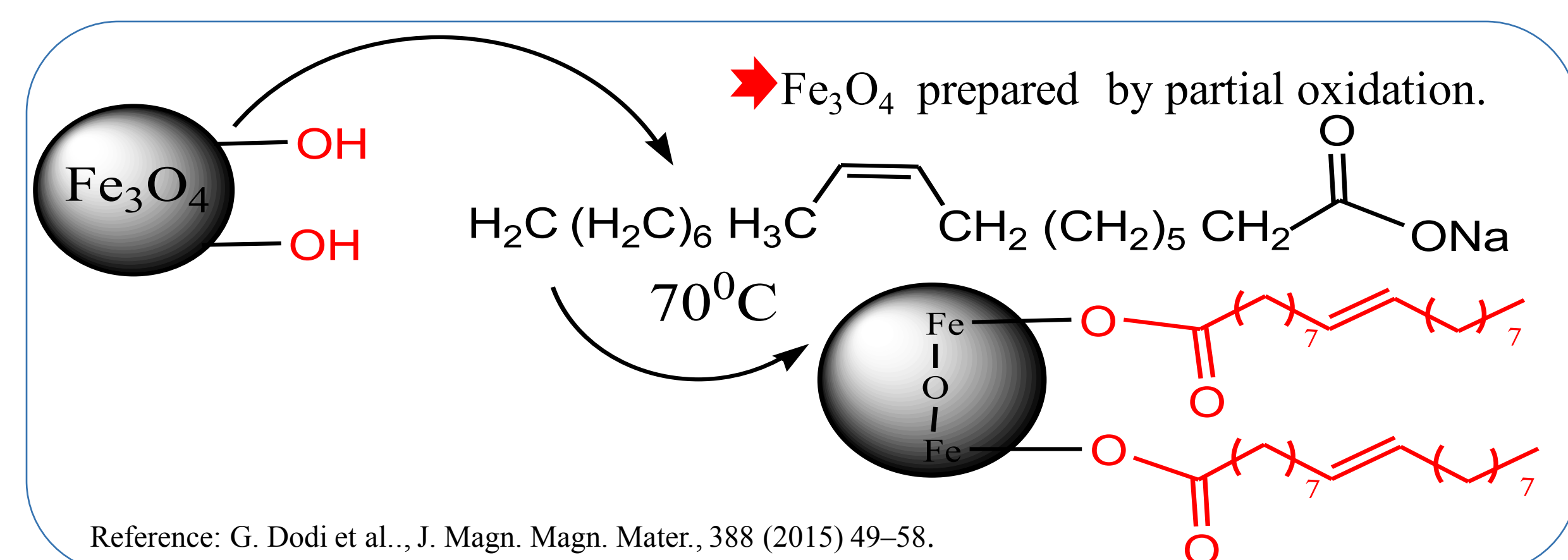
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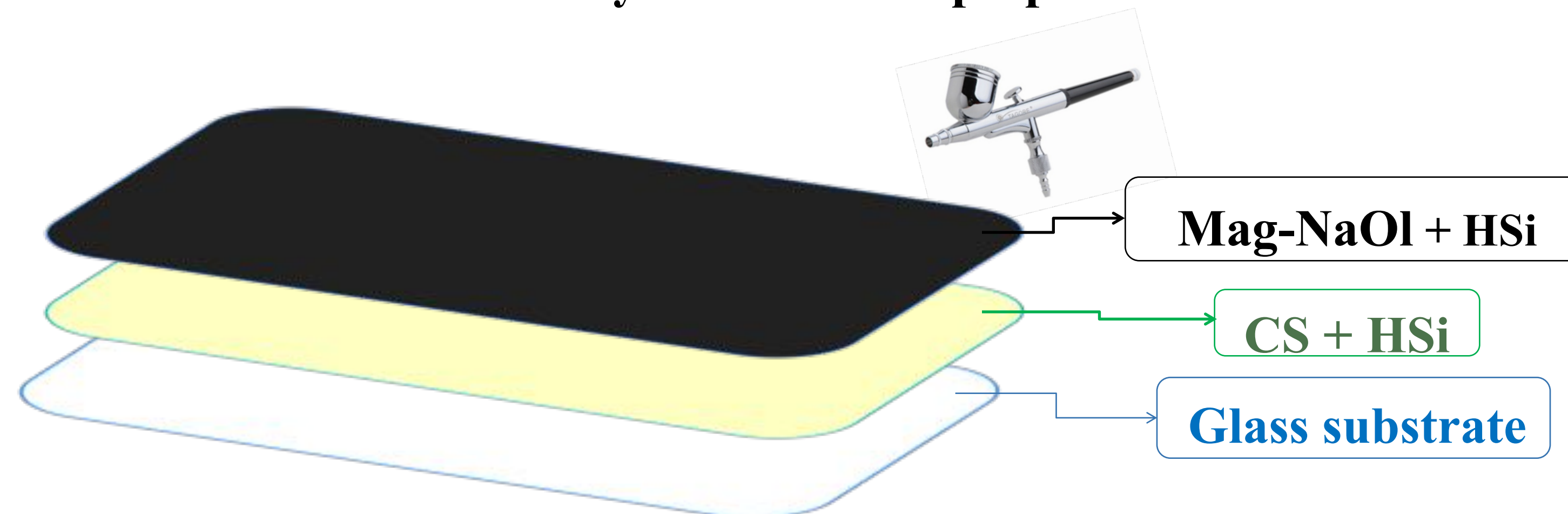
**AIM:** develop nanoparticle-polymer coatings with hierarchical roughness that are easy to manufacture using eco-friendly and/or renewable materials.

## Coating components

- I** - Nanoparticles: Sodium oleate functionalized magnetite (Mag-NaOl)
- II** - Polymeric matrix: Chitosan (CS)
- III** - Coupling agent: Partially hydrolyzed hexadecyltrimethoxysilane (HSi)

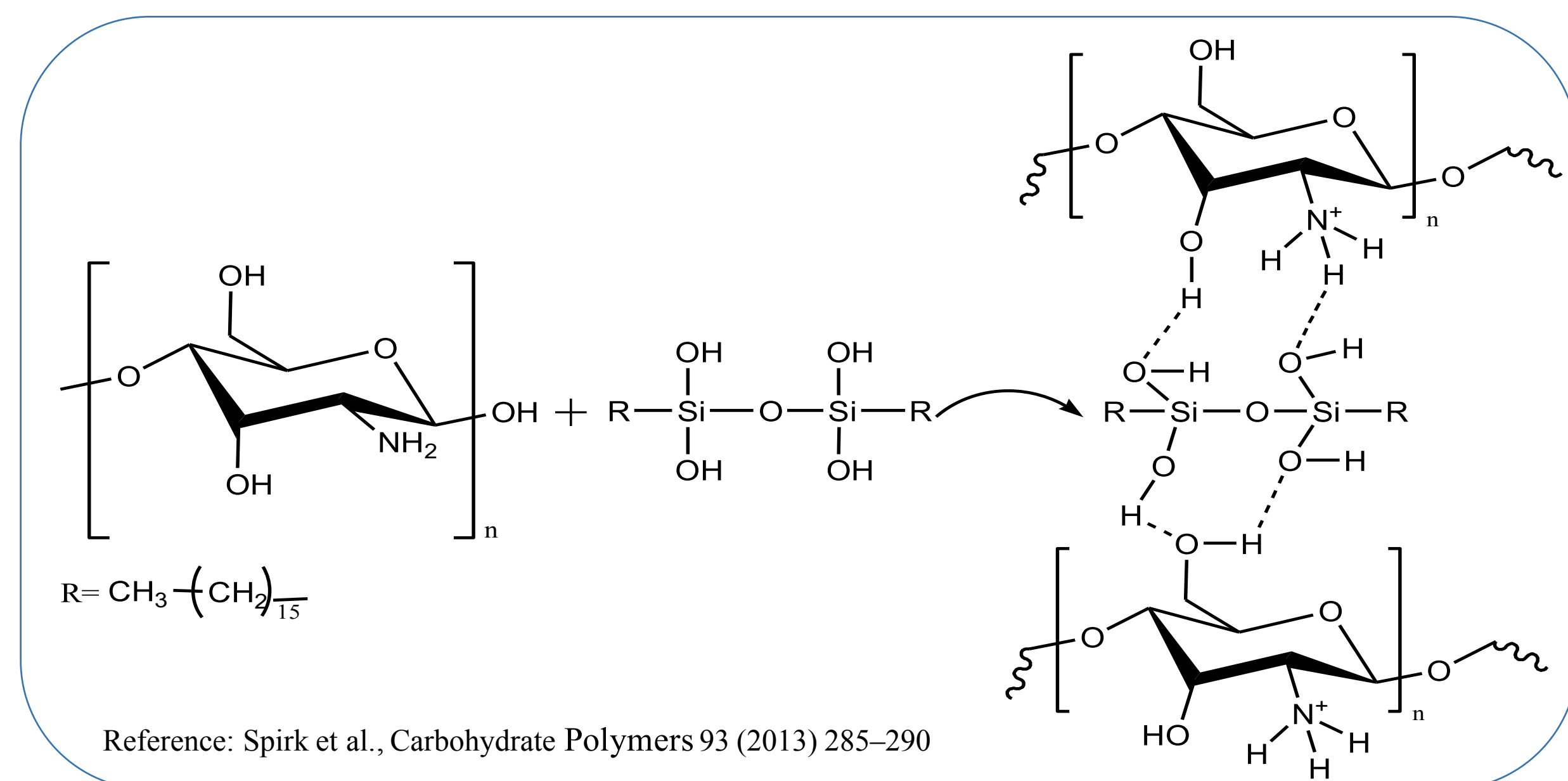
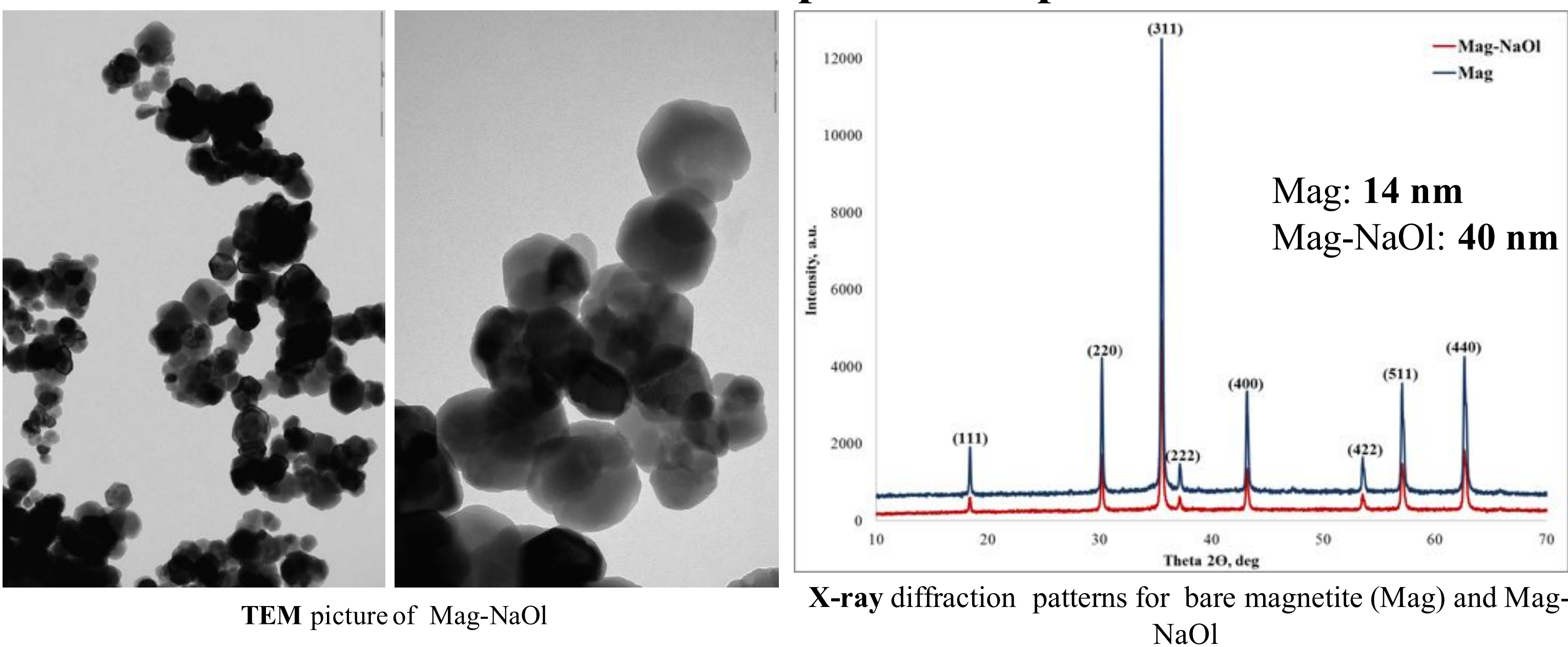


## Hybrid thin film preparation

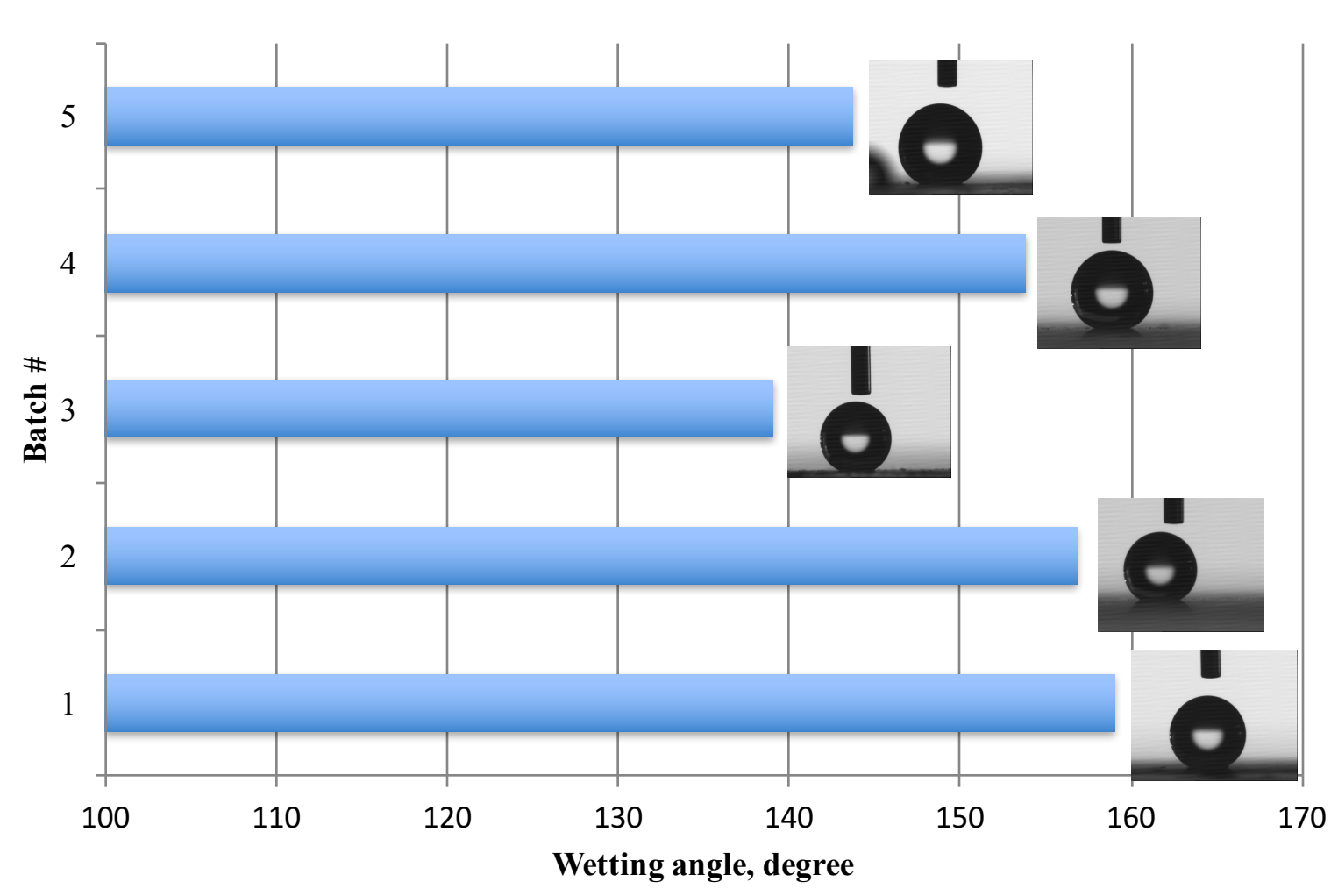


**Layer 1:** CS + HSi deposited by airbrush from aqueous acetic acid/ethanol solution.  
**Layer 2:** Mag-NaOl nanoparticles + HSi deposited by airbrush from alcohol suspension. The film is cured by heating, treated with ammonia and rinsed.

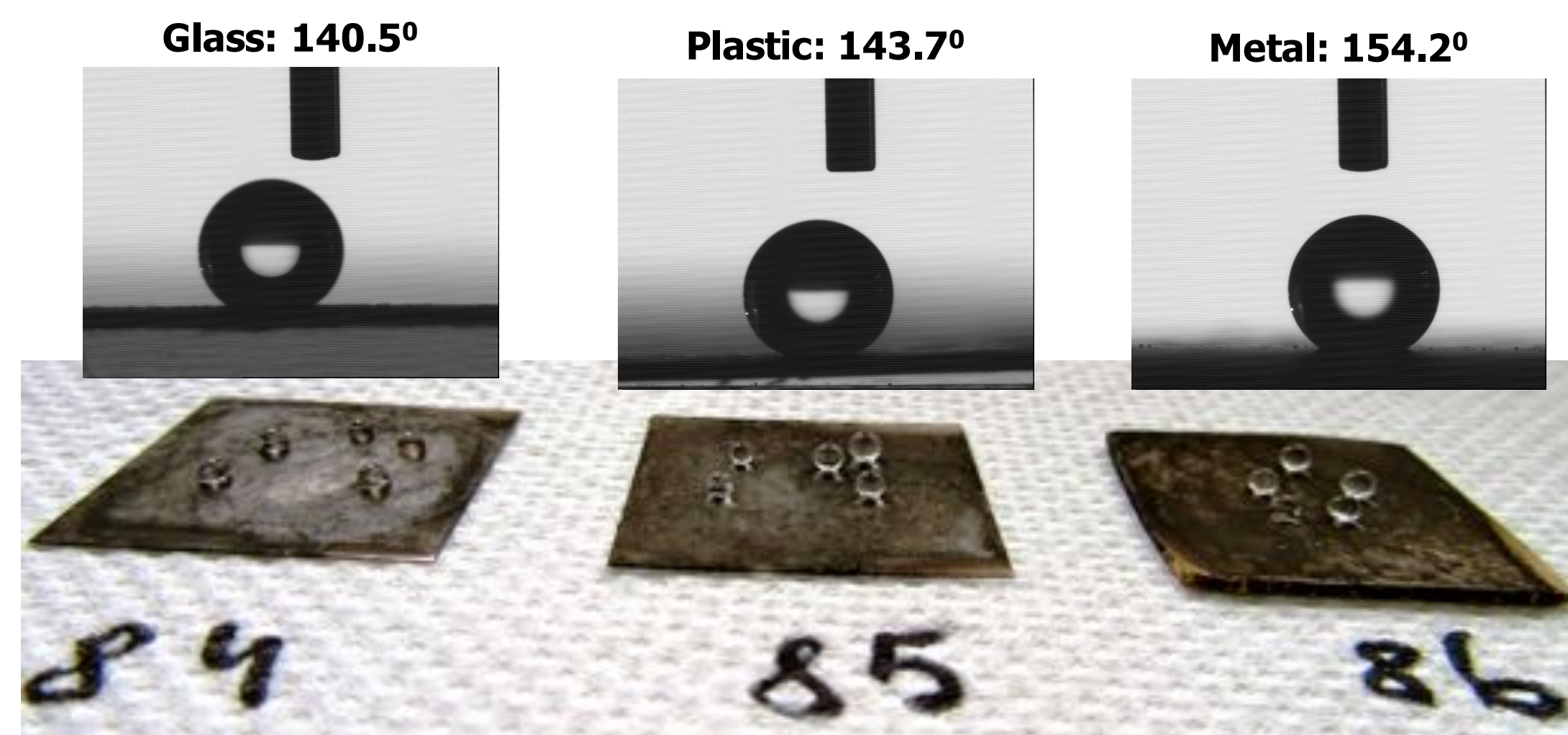
## Characterization of composite nanoparticles



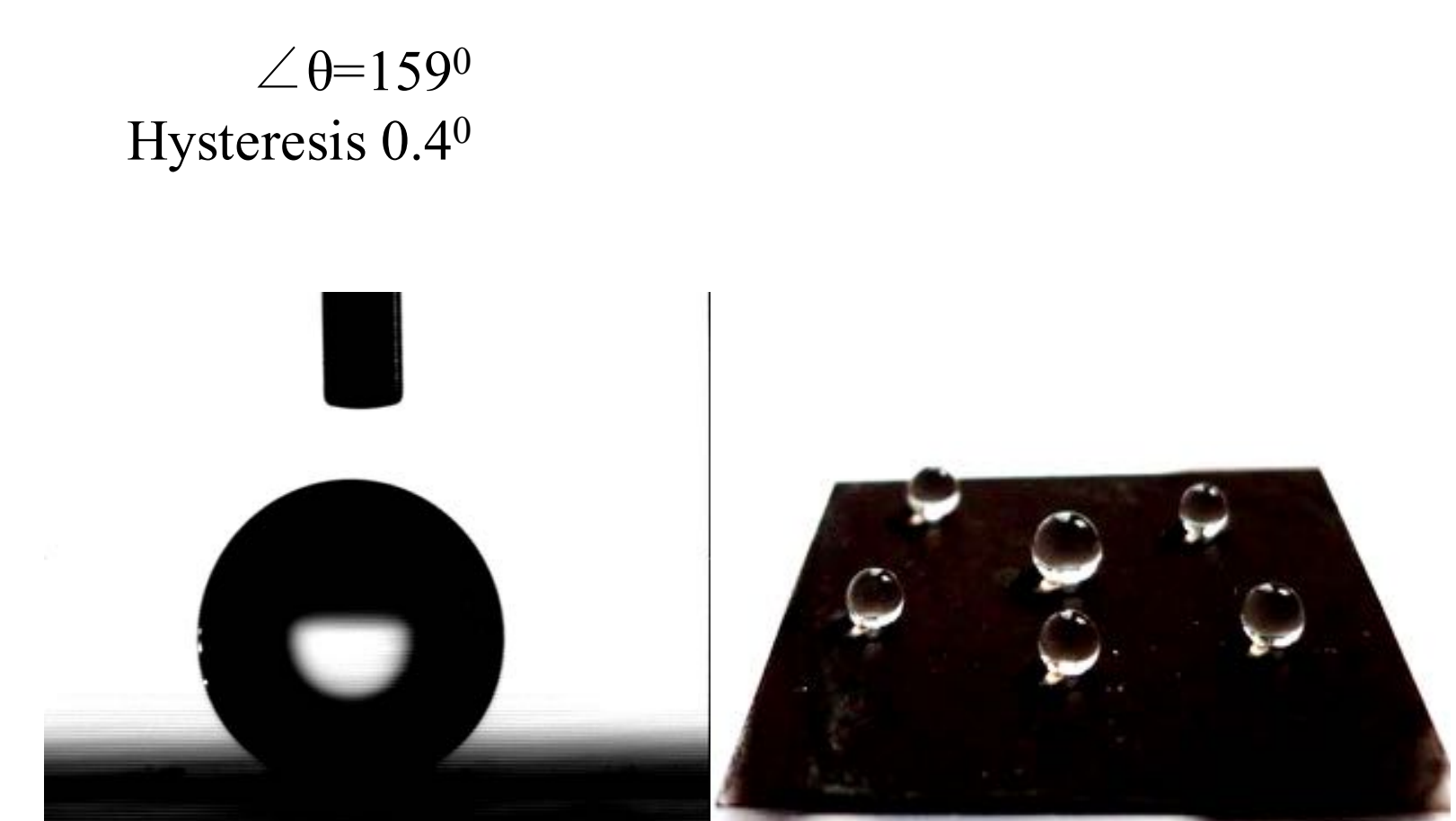
## Coating optimization and characterization



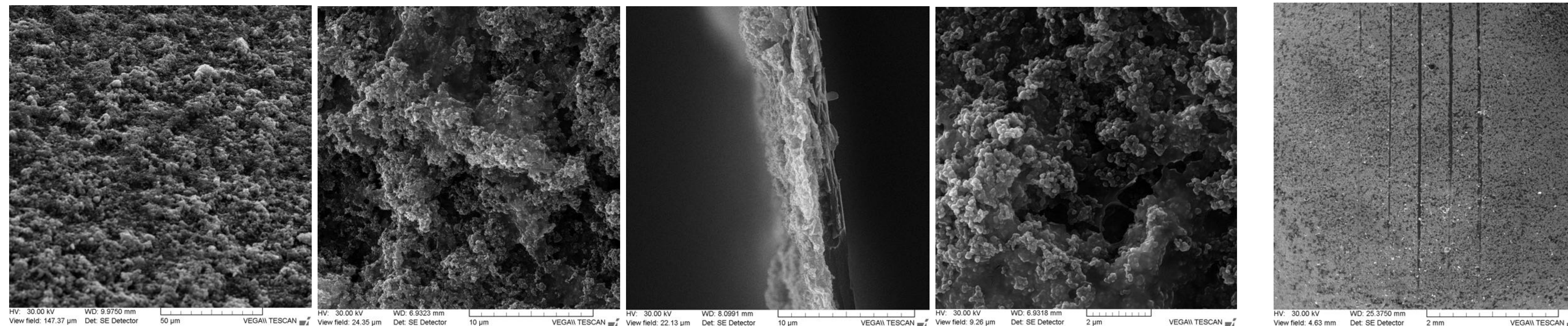
✓ **Reproducibility study**  
Deposition on glass, curing at 70°C



✓ **Deposition on various surfaces**  
Curing at 40°C



✓ **Contact Angle and Non-Wetting Properties**  
Deposition on glass under optimum conditions



SEM pictures evidencing micro scale protuberances with nano scale features

## CONCLUSIONS

A method to prepare hybrid coatings using eco-friendly materials was proposed and optimized. Lot to lot reproducibility and deposition on various surfaces was demonstrated. The films evidence hierarchical roughness and good adherence to substrate. The maximum water contact angle is 159° (superhydrophobic surface).

**ACKNOWLEDGEMENTS:** This work was supported by a grant of the Ministry of National Education, CNCS-UEFISCDI, project number PN-II-ID-PCE-2012-4-0433.

✓ **Scratch test:**  
critical adhesion load: 18.7 mN

Line 1: 0 - 50 mN  
Line 2: 0 - 100 mN  
Line 3: 0 - 200 mN  
Line 4: 0 - 300 mN