



Directed Synthesis of Porous Aromatic Frameworks as Supports for Transition Metal Nanoparticles in Various Hydrogenation Processes

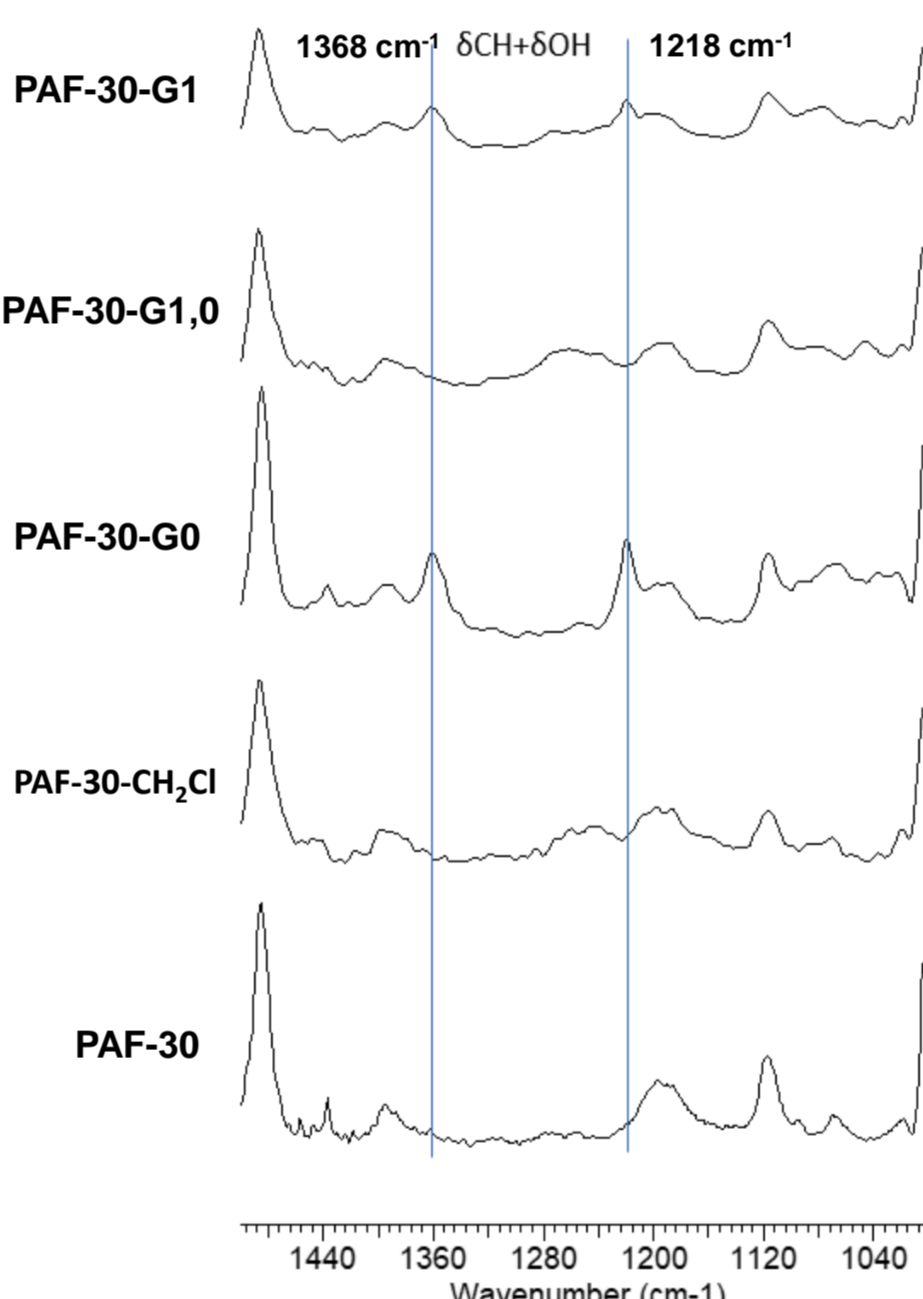
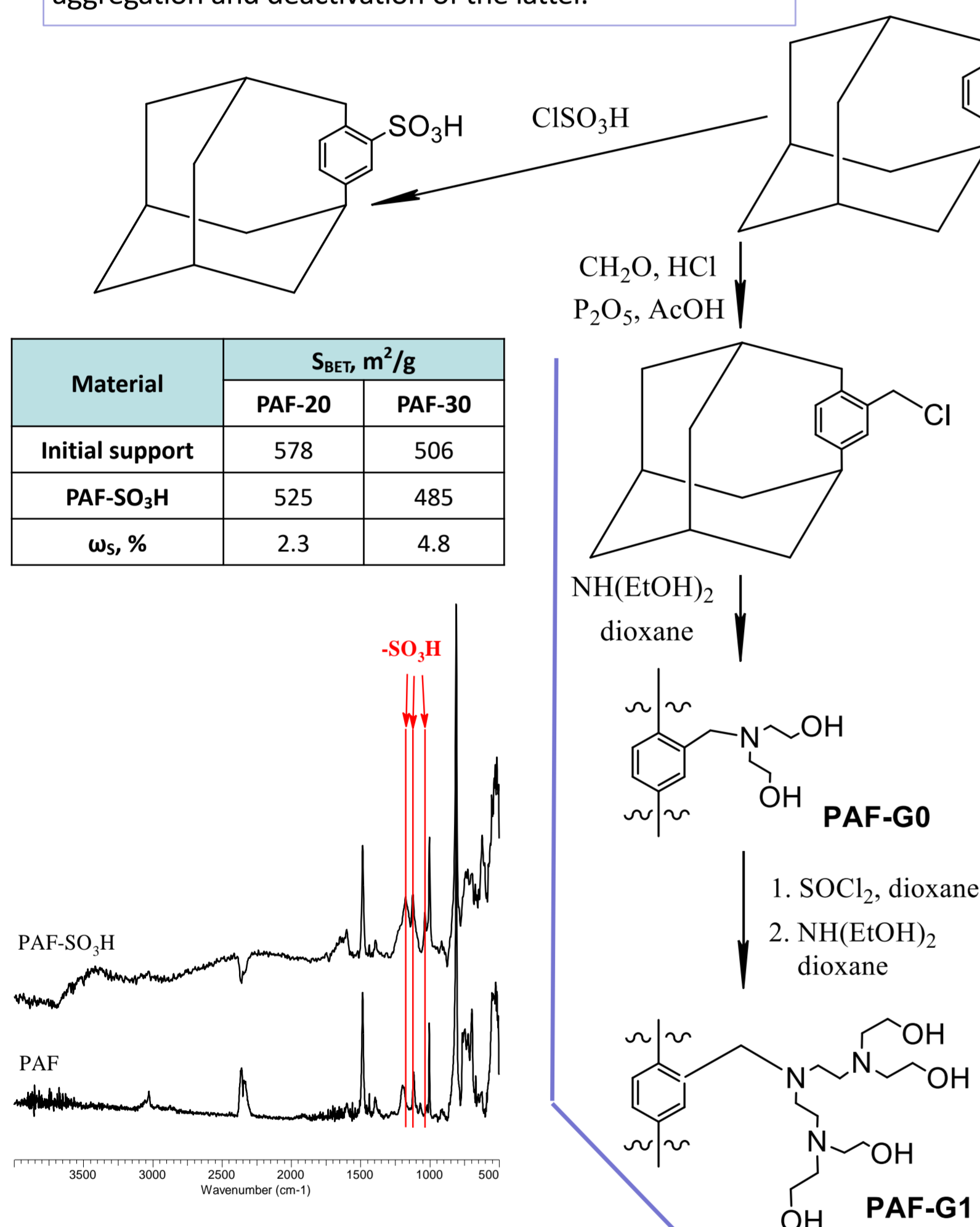
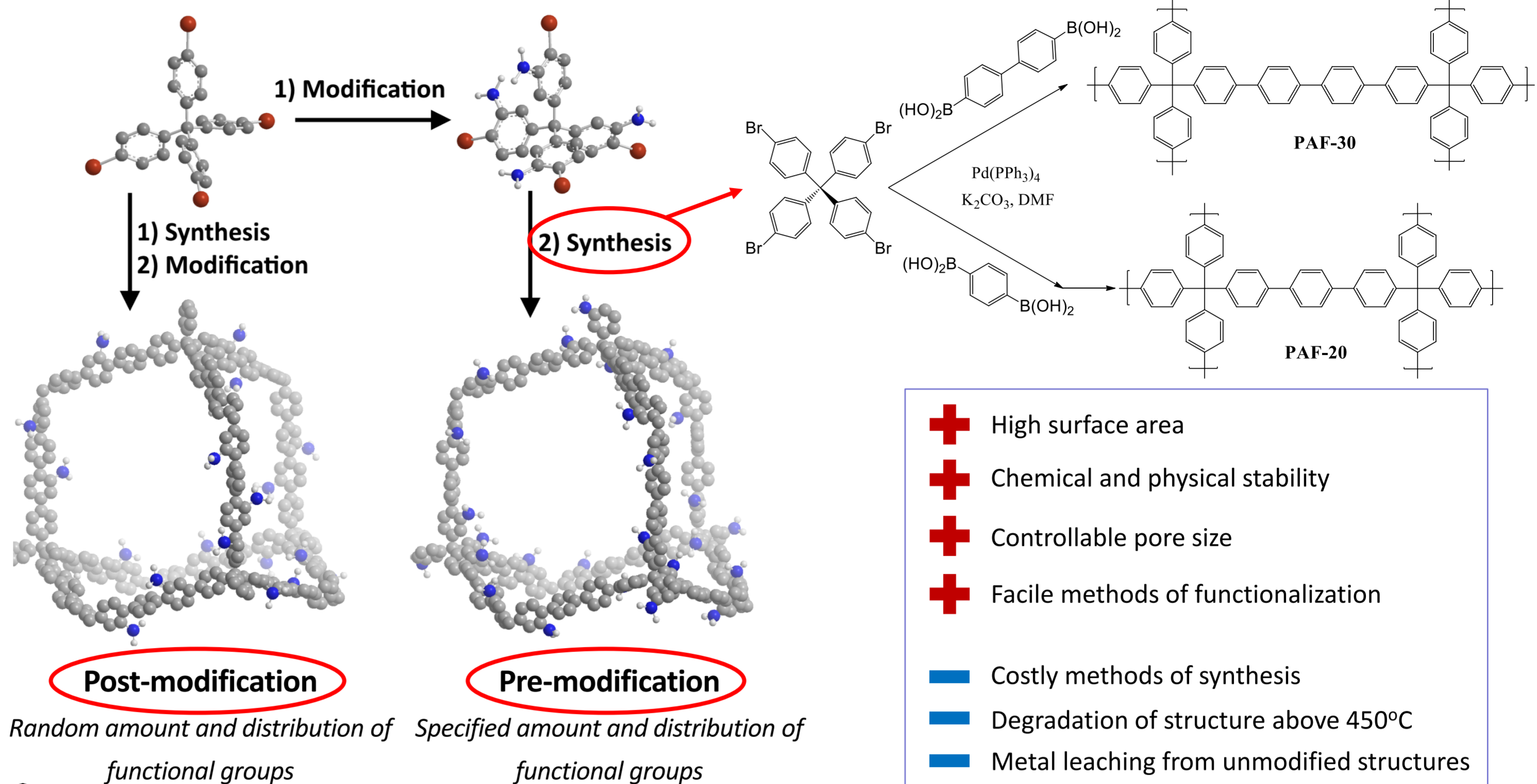
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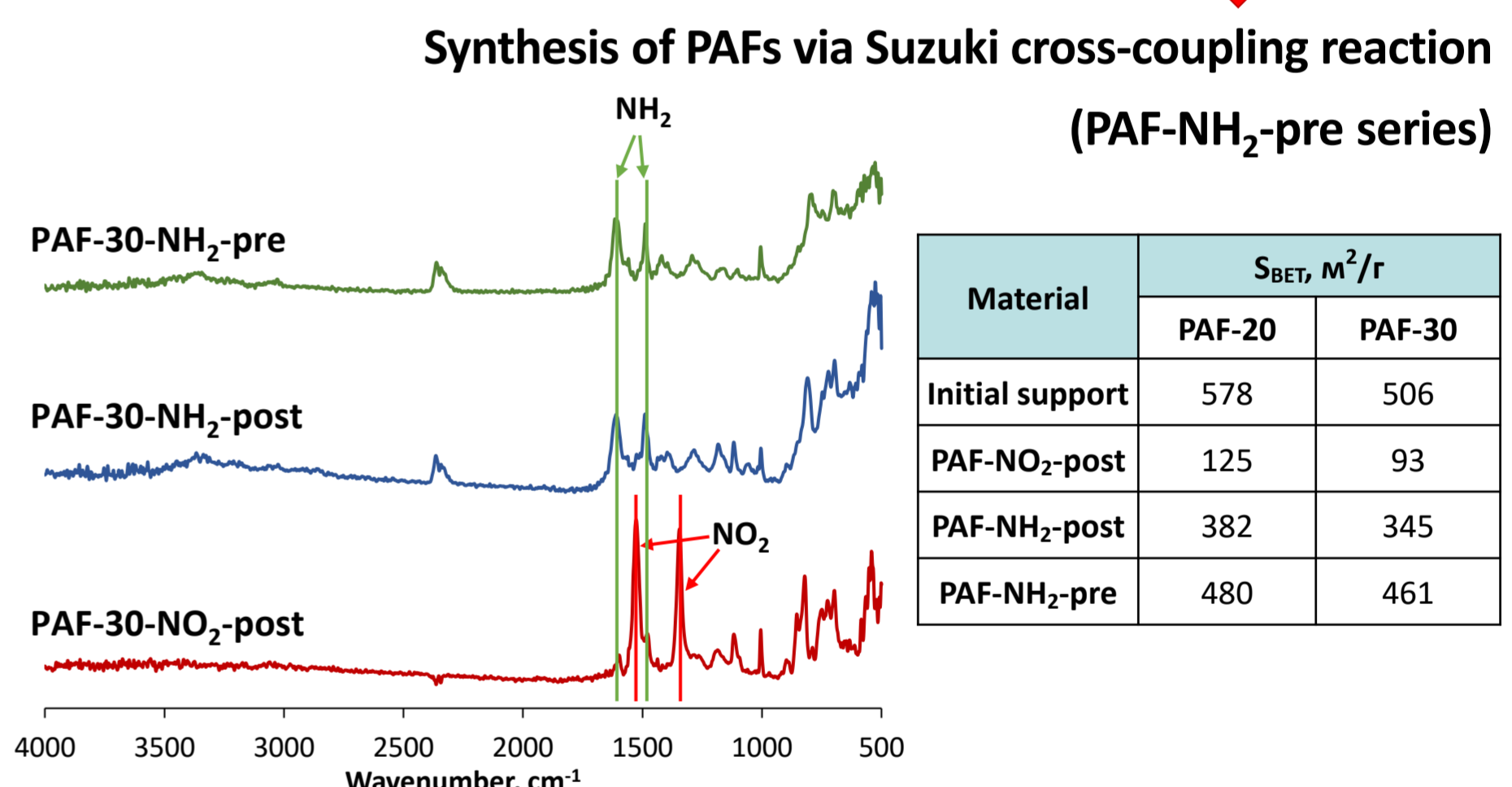
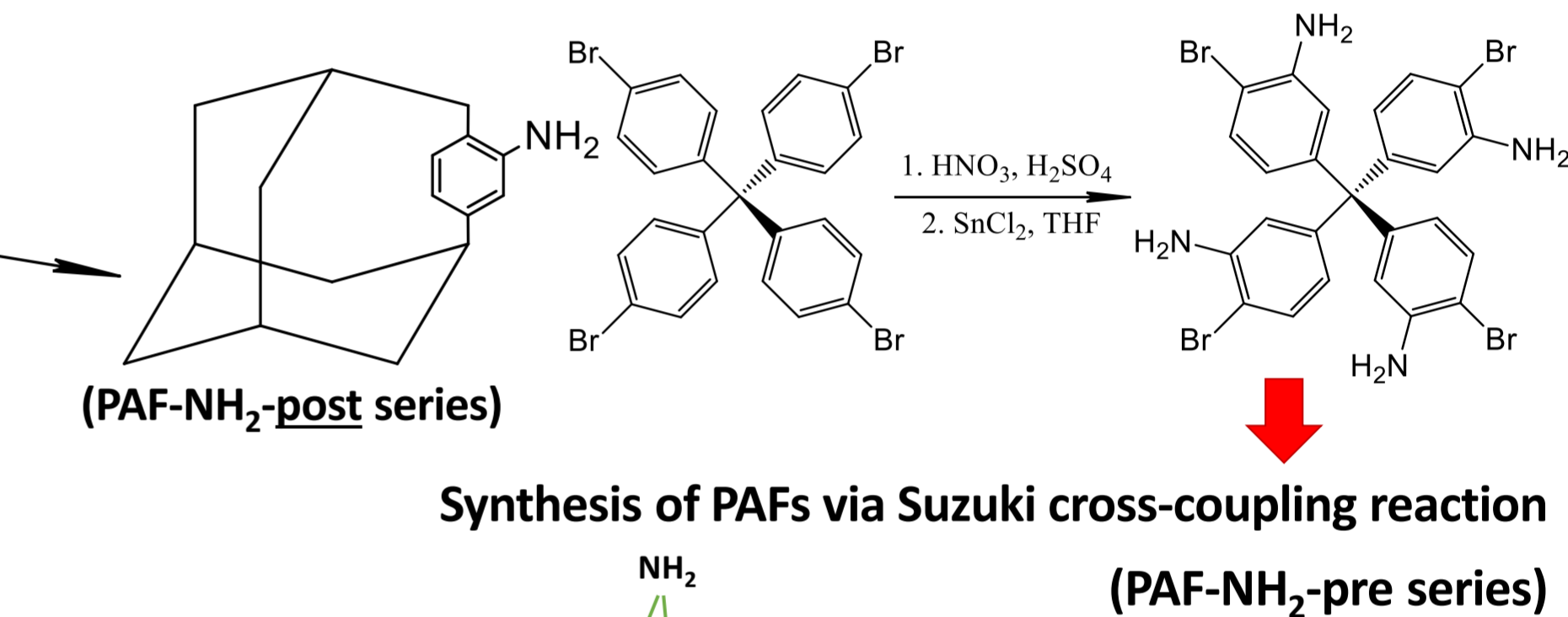
Porous Aromatic Frameworks (PAFs) are polymer materials constructed of aromatic rings, connected to each other by covalent C-C bonds. They attract more and more attention in various research areas, such as gas storage and separation, metal sorption, photoconduction, membrane technologies and *heterogeneous catalysis*.

Thorough selection of reagents and synthetic conditions allows to obtain PAFs with already implemented functionalities and *structural characteristics tuned for any specific purpose*, for instance, for enantioselective or shape-selective processes.

This is also extremely important for the *effective stabilization of transition metal nanoparticles* – one of the most effective type of catalysts in fine organic synthesis and petrochemistry. The use of PAFs as supports for metal nanoparticles solves the problem of aggregation and deactivation of the latter.

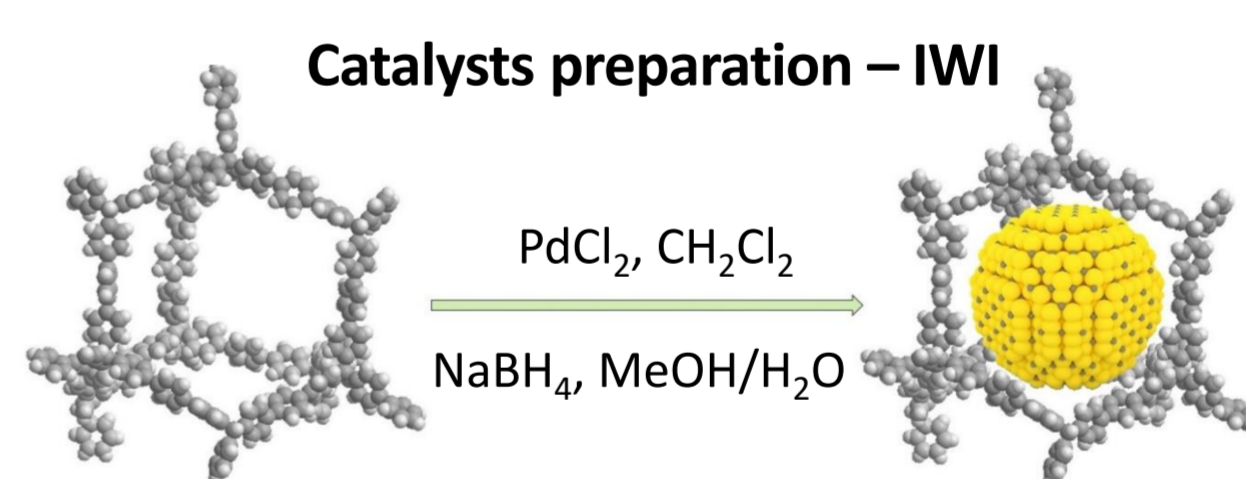


Material	S _{BET} , m ² /g	
	PAF-20	PAF-30
Initial support	578	506
PAF-CH ₂ Cl	471	459
PAF-G0	28	61
PAF-G1	5	38

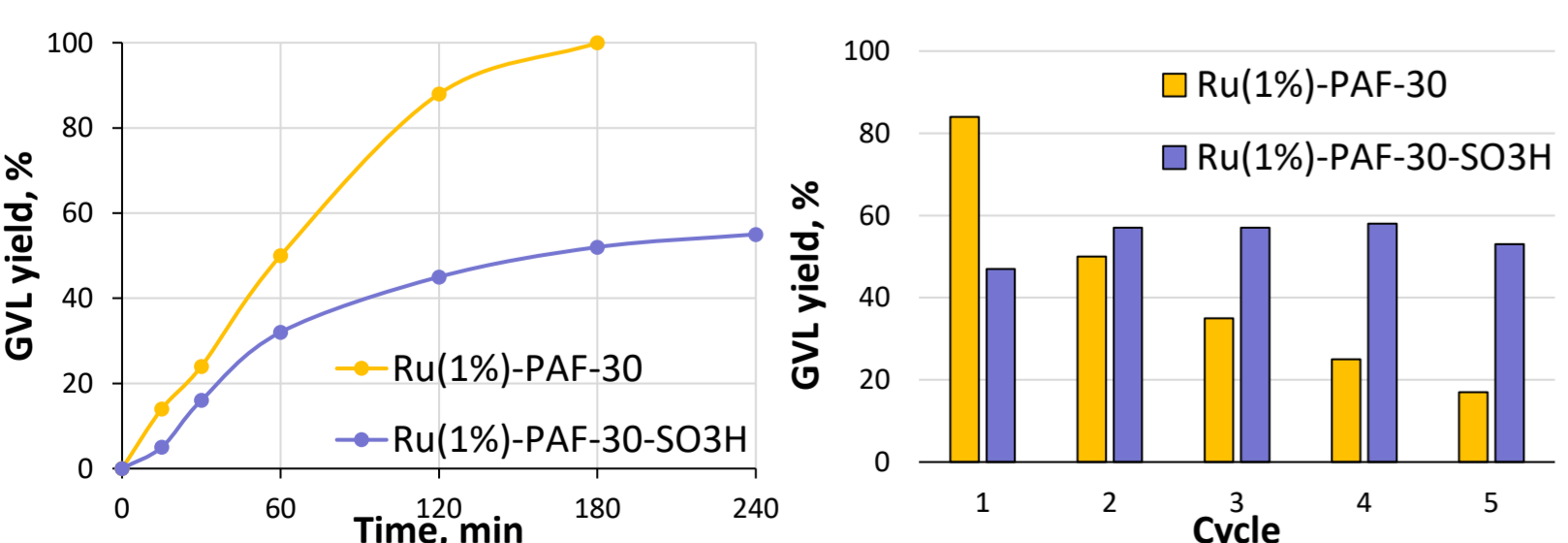
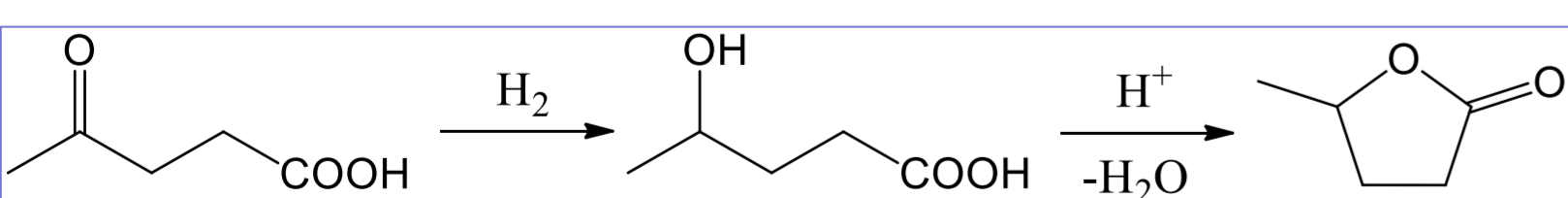
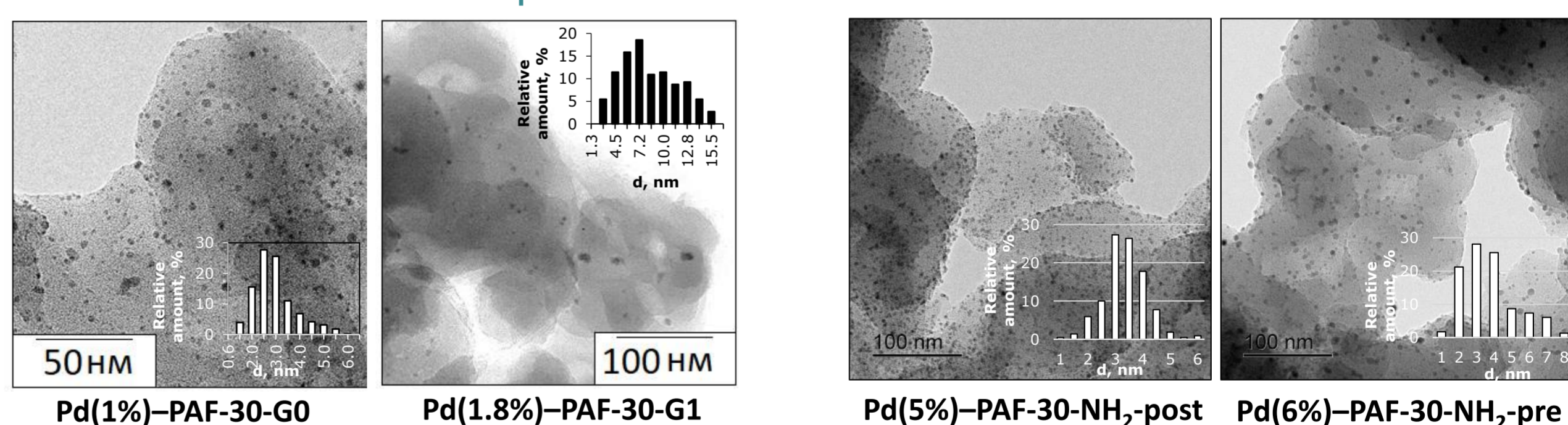
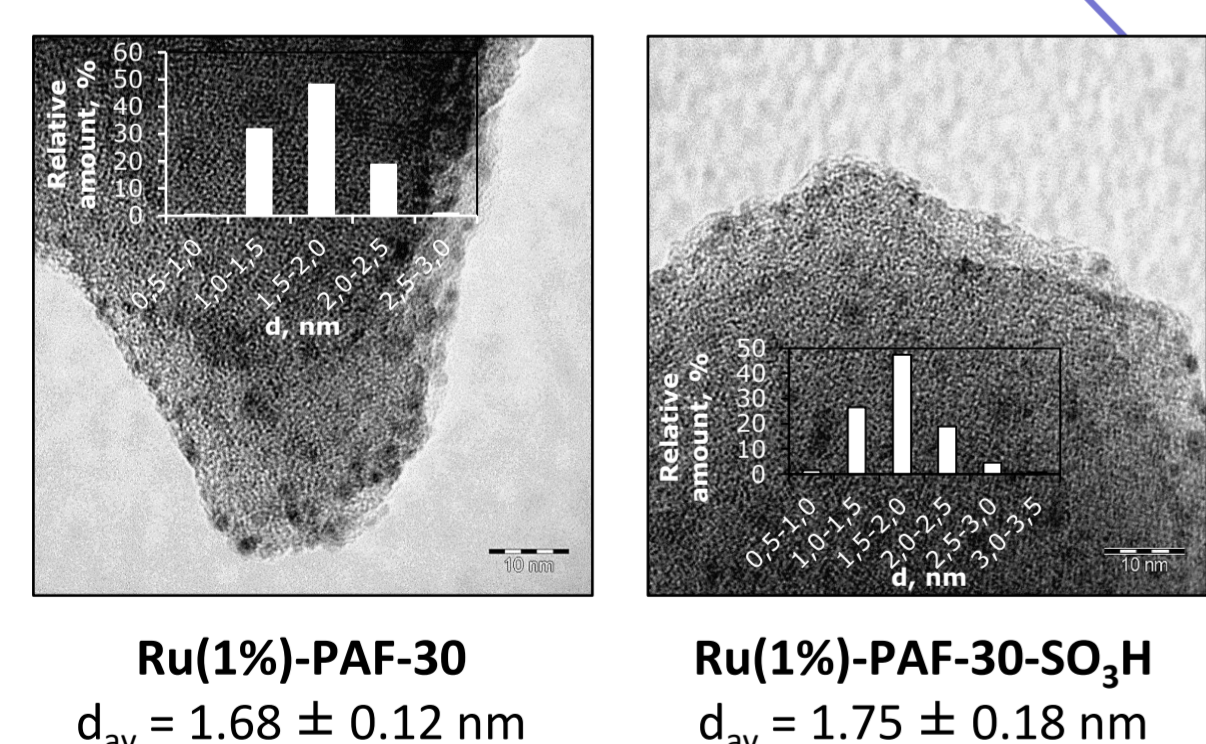
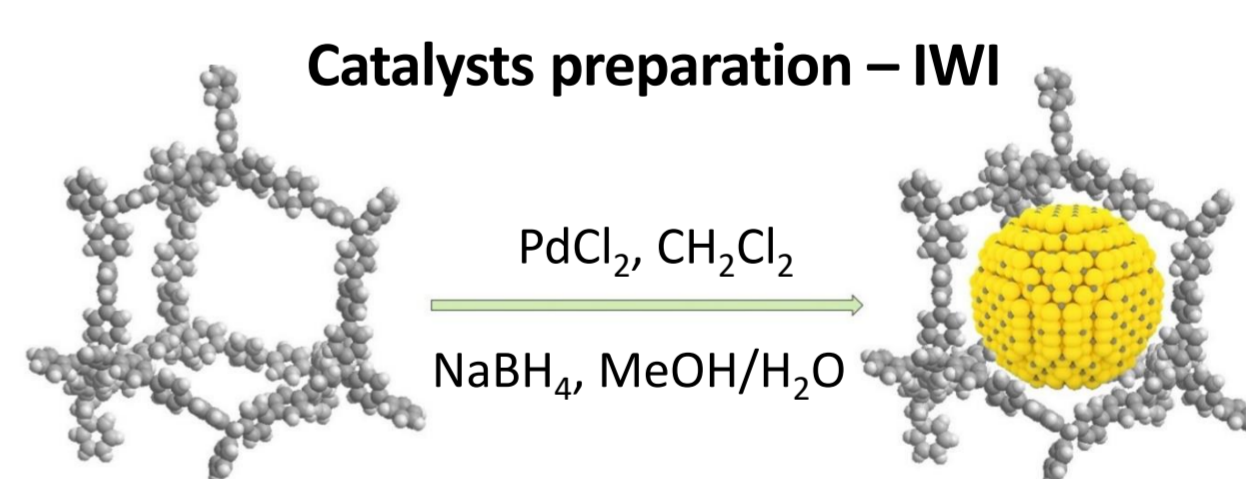


Material	S _{BET} , m ² /g	
	PAF-20	PAF-30
Initial support	578	506
PAF-NO ₂ -post	125	93
PAF-NH ₂ -post	382	345
PAF-NH ₂ -pre	480	461

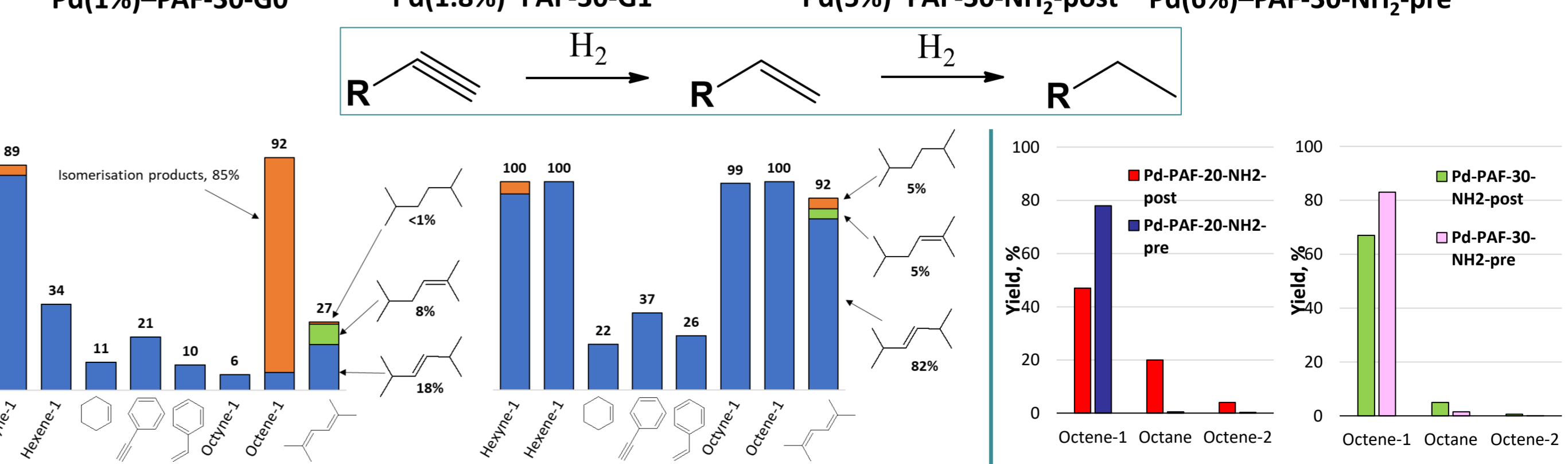
Synthesis of PAFs via Suzuki cross-coupling reaction (PAF-NH₂-pre series)



Catalysts preparation – IWI



Reaction conditions: 3 mg of catalyst, 57 μl LA, 1.3 ml H₂O, substrate:Ru = 1800:1, 1 MPa H₂, 80°C, 1 h (for recycles).



Reaction conditions: 1 mg of cat, sub: Pd = 22500–54000:1, 1 MPa H₂, 80°C, 30 min

Modification with **ethanolamine branches** reveals the importance of size-selectivity between PAF-20 and PAF-30. Catalysts based on PAF-G1 materials are mostly unactive due to the pore blockage.

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Incorporation of **-NH₂** groups improves stability of the catalysts. Catalysts based on pre-modified PAFs are more selective.

Insertion of **-SO₃H** groups in the structure of the support leads to the drop of the catalytic activity, however, improves catalyst's stability!