



PatteRned cOatings based on 2D materials benzoxazine reSin hybrids for broad range Pressure detection

Official starting date: 01-05-2020; ending date: 30-04-2023 extension: 31-12-2023



Partner 1 (coordinator)	Partner 2	Partner 3	Partner 4	
CIRMAP	UNISTRA	CUT	LOMPS	
University of Mons	University of Strasbourg	Chalmers Technology	University of Nova Gorica	
Associated partner	Core partner	Core partner	Associated partner	

Core Project Contact Person: Prof. Xinliang Feng, TU Dresden, WP13



The scientific approach





The First Results



Benzoxazine studied	Tg determined by molecular simulation			
BA-a	208°C			
P-pPDA	216°C			
4EP-pPDA	150°C			
MDP-PBz	249°C			
	160°C			
PtPA	≅ 110°C			

A trifunctional benzoxazine (PtPA)



• Storage modulus (25°C) of resin by DMA in compression mode \cong 80 MPa

Developing a protocol for pressure sensing

Pressure sensing device





PtPA/rGO pressure sensors



PtPA/rGO pressure sensors: Influence of curing



Strategy to decrease Tg and E'







Phenol/Poly(dimethylsiloxane), bis(3-aminopropyl) terminated-based 1,3-benzoxazine PH-PDMS



niversité de Mons

- PH-PDMS precursors are liquid at room temperature
 2 different PH-PDMS were synthesized for the moment:
 - a PH-PDMS from a PDMS amine-terminated backbone of 900-1000 g.mol⁻¹
 - a PH-PDMS from a PDMS amine-terminated
 backbone of 2500 g.mol⁻¹

Another strategy: Intercalation



- Stacked graphene oxide layers
- Select the right molecules
- Pillared graphene
- Enlarged interlayer distance
- Amino groups

- Intercalation of benzoxazine
- Polymerization of benzoxazine
- Pillared structures

Another strategy: Intercalation



Another strategy: Intercalation





XRD of starting materials and pillared graphene

- PB: pure benzoxazine
 TG: TKAm pillared graphene
 TGB: TKAm-graphene-benzoxazine
 TGB11: TG:B=1:1 (weight ratio)
- Peak shift act as a proof of intercalation.

GO – 11.45 deg GO_TKAm – 6.315 deg TGB11 – 5.919 deg

- Intercalation of TKAm
- Intercalation of benzoxazine



Work program

WP	M1-3	4-6	7-9	10-	13-	16-	19-	22-	25-	28-	31-	34-
				12	15	18	21	24	27	30	33	36
1				D1.1				D1.2				
								M1				
T1.1												
T1.2												
T1.3												
2						D1.1		M2				D1.2
T2.1												
T2.2												
3						D2.1		D2.2		D2.3		D2.4
T3.1												
T3.2												
4	D3.1/2	D3.3				D3.4						D3.5
												M3
T4.1												
T4.2												
T4.3												

WP1. Synthesis and designWP2. Advanced characerization and modellingWP3. Patterning and sensing devices