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C. Gourgon, A. Ferchichi, M. Panabière, E. Grinerval, O. Desplats, et al.. N-POEM: Nanostructures imprinted on polymers and Si for electromagnetic applications. Micro- and Nano-Engineering conference- MNE 2014, 2014, Lausanne, Switzerland. hal-01798495

HAL Id: hal-01798495

<https://hal.science/hal-01798495v1>

Submitted on 8 Nov 2022

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NPOEM : Nanopatterns imprinted on POLymers for ElectroMagnetism



C. Gourgon¹, A.K. Ferchichi¹, M. Panabière¹, E. Grinval¹, O. Desplats¹,
J.B. Brückner², L. Escoubas², J. Le Rouzo², N. Mikuszeit³, B. Viala³, C. Dubarry³, D. Duché³, V. Brissonneau³,
N. Vukadinovic⁴, P. Thomas⁴, G. Bergine⁵, T. Lannuzel⁶

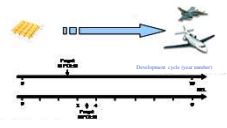


1- Laboratoire des Technologies de la Microélectronique, LTM-CNRS-UJF, CEA-LETI, 17 av. des Martyrs, 38 054 Grenoble, France
2- IM2NP, Aix-Marseille Uni. 6242 domaine universitaire St Jérôme 13 397 Marseille, France
3- CEA, 17 A. des martyrs, 38 054 Grenoble, France
4- Dassault- Aviation 78 quai Marcel Dassault, 92 552 St Cloud, France
5- Thalès optronique SA, 2 A. Gay Lussac, 78 990 Erlancourt, France
6- Arkema 4 R. H. Moissan, 69 310 Pierre Bénite, France,
e-mail: cecile.gourgon@cea.fr

Introduction

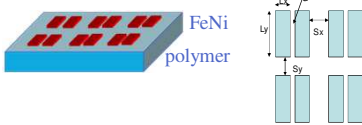


- N-POEM : funded by ANR 2010-2014 / industrial exploratory project / 6 partners
- Objectives: conception, realization and characterization of periodic nanostructures for 3 electromagnetic applications : microwave absorbers, optical filters, antireflective surfaces
- Applications in aeronautics
- Nanoimprint on flexible polymers

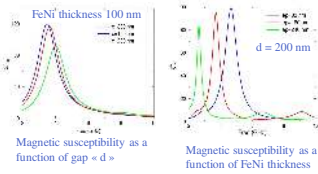


N-POEM = TRL-3-4

Simulation

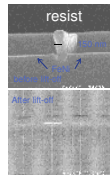
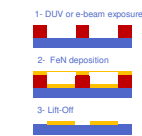


- Absorbance controllable from 0,8 GHz to 5 Ghz
- Based on dipolar coupling between adjacent bands
- Control resonance frequency by adjustment of FeNi thickness and/or gap « d » between two adjacent bands



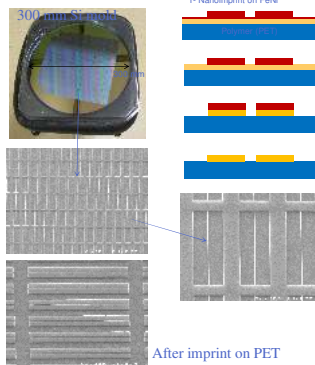
Microwave absorber

On silicon

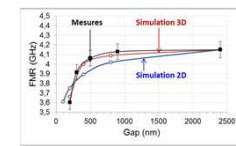
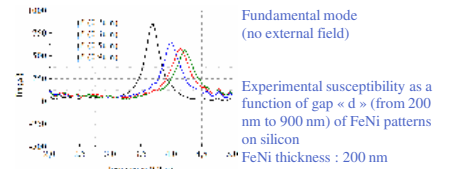


Fabrication

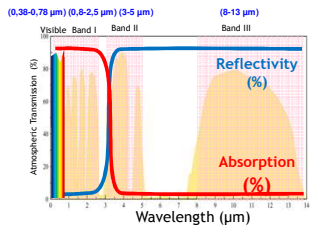
On large scale PET



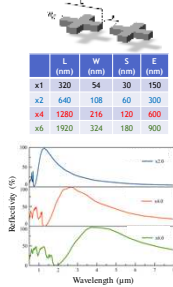
Magnetic Characterization



Optical filter

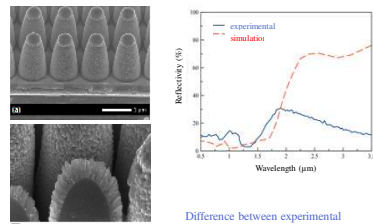


Ag crosses

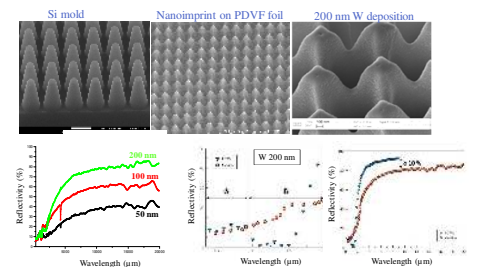


Simulation results demonstrate that Ag crosses are not adequate to achieve high reflectivity in band III.

W cones

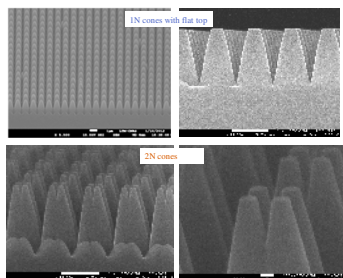
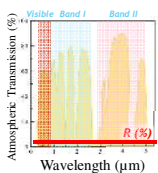


W «egg box»

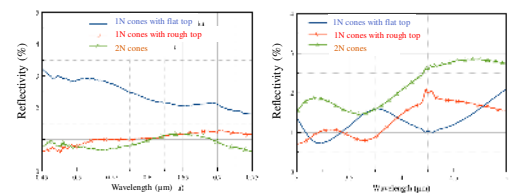
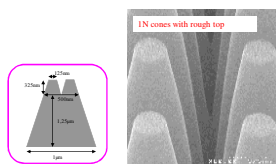


Antireflective surface

Objective: reflective coefficient lower than 2% between 0,4µm and 5µm on Si



Fabrication by E-beam lithography and specific plasma etching processes



Conclusion

- 3 demonstrators realized and characterized, corresponding to 3 functionalities
- Good agreement with specifications and simulation
- Perspectives : increase TRL level and evaluate defect impact and aging of the patterns on functionalities for industrial applications

References

- [1] J.B. Brückner et al. Optics Express 21 (14) 2013 – p 16992-17006
- [2] J.B. Brückner et al. Applied Physics Letters 104 2014 p 081114
- [3] J.B. Brückner et al. Optics Express 21 (13) 2014 p 16043-16055