

Table of content

1	Introduction	1
2	Su-Schrieffer-Heeger (SSH)	3
2.1	Tight binding model	3
2.2	Edge states	5
2.3	Chiral Symmetry	6
2.4	Bulk	7
2.5	Bipartite lattice of domain walls states	10
3	Graphene	16
3.1	Crystalline structure of bulk graphene	16
3.2	Graphene Nanoribbons and Nanotubes	20
3.2.1	Zig-zag (ZGNR)	20
3.2.2	Armchair (AGNR)	21
3.3	Strain in AGNRs	22
4	Interface States in Modulated AGNRs	24
4.1	Junction states	24
5	AGNR superlattices	28
5.1	Mechanical Properties of a Modulated Superlattice	30
5.2	Strain and Electronic Structure of Superlattices.	33
5.3	Sublattice Polarization and robustness of the edge states	35

5.3.1	Sublattice Polarization	35
5.3.2	Topological transition	37
5.4	Methods	38
6	Summary and Conclusions	40
	Bibliography	48
7	Annexes	49
	Annex A Supplementary information	50
A.1	Graphene Density of states	50
	Annex B Supplementary information	51
B.1	Experimental results	51
	Annex C Supplementary information	54
C.1	Fracture Process	54
C.2	Penetration length of a zig-zag GNR	55