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High value-added magnetic activated carbon from industrial macroalgae waste by sustainable one-step chemical activation

E. Ciurcina[1], M. Díaz-Somoano[1], D. Martínez-Blanco[2], S. Rodríguez-Sánchez[1], P. Gorria[3], J.F. Marco[4], E. Fuente[1], B. Ruiz[1]

[1]Instituto de Ciencia y Tecnología del Carbono (INCAR), CSIC. C/ Francisco Pintado Fe 26, 33011, Oviedo, Spain.
[2]Scientific-Technical Services, University of Oviedo, C/ Dr. Fernando Bonguera s/n, 33006, Oviedo, Spain.
[3]Department of Physics, University of Oviedo, C/ Federico García Lorca, 18, 33007 Oviedo Spain.
[4]Instituto de Química-Física " Blas Cabrera", CSIC, C/ Serrano 119, 28006 Madrid, Spain.

OBJECTIVE

INDUSTRIAL WASTE MANAGMENT → ADSORBENT MATERIALS OBTENTION

Macroalgae "*Gelidium corneum*"

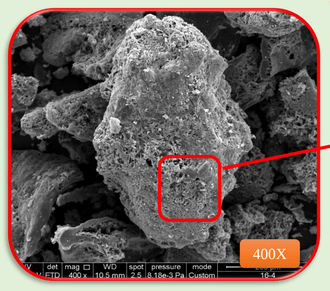
MACROALGAE WASTES (AM) → + $FeCl_3$ → One step chemical activation → MACs

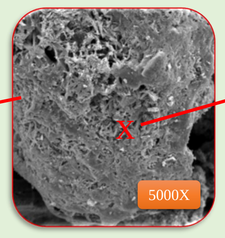
RESULTS & DISCUSSION

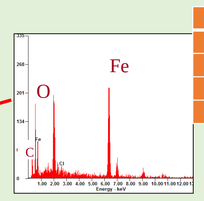
CHEMICAL AND TEXTURAL CHARACTERIZATION

Sample	T °C	Ash (%)	C (%)	H (%)	N (%)	Fe (%)	S_{BET} (m^2/g)
AM		7.7	43.99	5.95	5.21	-	<1
AMA220H0.5w	220	-	57.36	2.47	5.13	-	13
AMA400H0.5w	400	15.00	62.77	3.18	5.16	6.87	140
AMA500H0.5w	500	22.00	63.03	2.21	4.63	10.87	494
AMA600H0.5w	600	26.00	64.22	1.50	3.67	13.34	510
AMA700H0.5w	700	36.20	54.05	1.13	3.33	7.38	528
AMA800H0.5w	800	39.70	56.11	0.86	2.96	7.94	512

SEM-EDX

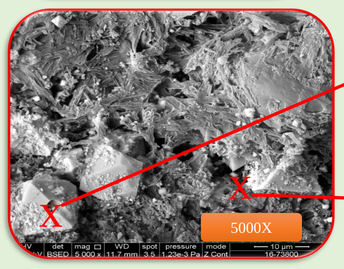


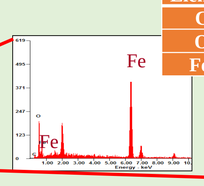




Element	Wt%	At%
CK	18.14	40.91
OK	15.74	26.65
ClK	01.34	01.02
FeK	64.78	31.42

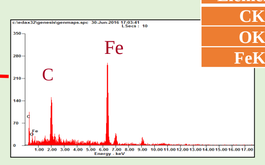
AMA400H0.5w



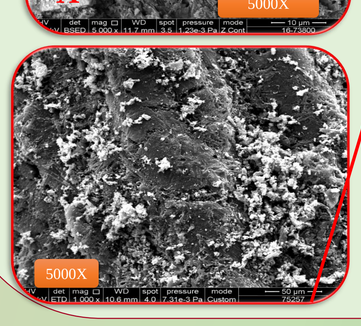


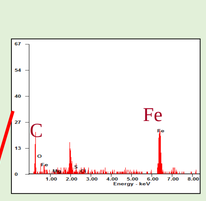
Element	Wt%	At%
CK	03.37	11.09
OK	11.56	28.61
FeK	85.07	60.30

AMA500H0.5w



Element	Wt%	At%
CK	23.51	56.27
OK	03.39	06.09
FeK	73.10	37.63





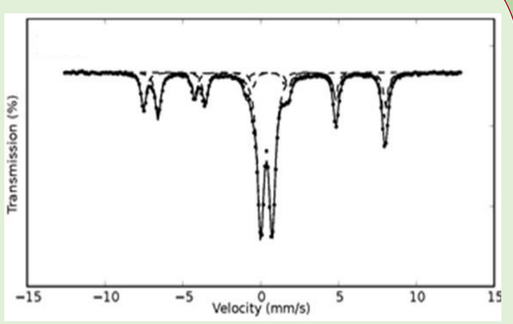
Element	Wt%	At%
CK	56.10	79.92
OK	07.46	07.98
MgK	01.02	00.72
SK	01.40	00.75
ClK	01.18	00.57
FeK	32.84	10.06

AMA800H0.5w

MOSSBAUER SPECTROSCOPY

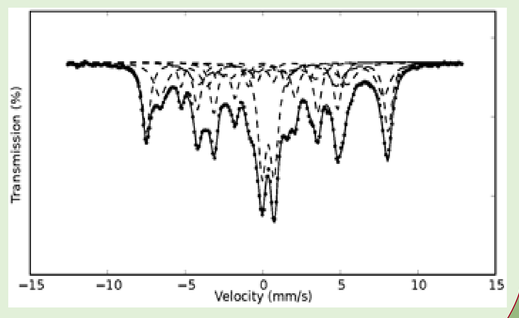
AMA500H0.5w

δ (mmS-1)	0,37	0,28	0,66
Δ (mmS-1)	0,74	-0,01	0,02
Asignación	Fe^{3+} Oh	Magnetita N.E	Magnetita N.E



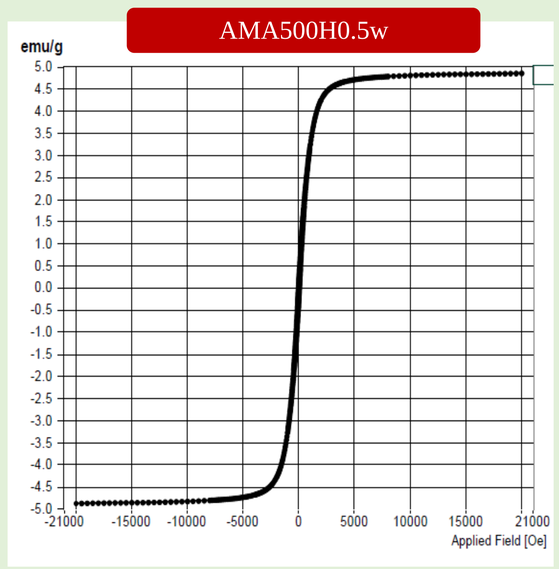
AMA800H0.5w

δ (mmS-1)	0,35	0,3	0,58	-0,02	0,63	0,16
Δ (mmS-1)	0,78	-0,01	0,01	-0,09	0,02	0,05
Asignación	Fe^{3+} Oh	Magnetita N.E	Magnetita N.E	Fe^0	Carburos	Carburos



VIBRATING SAMPLE MAGNETOMETER (VSM)

AMA500H0.5w



CONCLUSIONS

- **The proposed methodology for obtaining MAC through one-step chemical activation give good results.**
- **Activation temperature at 700 and 800ºC favoured greater area S_{BET} and optimal chemical characterization.**
- **Mössbauer spectroscopy and VSM confirm the existence of different iron species (Magnetite and Paramagnetic Fe^{3+}) in MACs obtained at high temperature.**

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