

ANEXO

ANÁLISIS DE MICROPLÁSTICOS EN CREMAS EXFOLIANTES

Autora: Sara Díaz de la Fuente

Tutora: M^a Jesús Díez Arias

Curso 2021/2022

ANEXO

[4] Informe de 2018: distribución mundial de la producción de plástico

Fuente: <https://es.statista.com/grafico/21899/distribucion-de-la-produccion-mundial-de-plastico-por-region-en-2018/>



[5] Tabla plásticos de uso común

Fuente: <http://aliso.pntic.mec.es/cm10029/PLASTICOS/plasticos%20comunes.html>

NOMBRE	PROPIEDADES	APLICACIONES
Polietileno (PE)	Termoplástico, traslúcido en lámina, flexible, permeable a hidrocarburos, alcoholes y gases, resistente a los R-X y los agentes químicos. Hay dos tipos: <ul style="list-style-type: none"> • de alta densidad (HDPE) • de baja densidad (LDPE) 	Láminas, bolsas, tuberías, revestimientos aislantes, tapones, tapas, envases, juguetes.
Polipropileno (PP)	Termoplástico, baja densidad, rigidez elevada, resistente a los R-X, muy poco permeable al agua, resistente a las T ^a elevadas (<135°C) y a los golpes.	Artículos domésticos, envases, carrocerías moldeadas, baterías, parachoques, muebles de jardín, jeringuillas, frascos, prótesis.
Poliestireno (PS)	Termoplástico, transparente en lámina, no tóxico por ingestión, buenas propiedades ópticas y eléctricas, fácil de teñir, resistente a R-X, aceites y grasas.	Envases, utensilios de cocina, difusores ópticos, revestimientos de muebles, aislamiento térmico, juguetes, artículos de oficina, maquinillas de afeitar desechables.
Policloruro de vinilo (PVC)	Termoplástico, flexible o rígido, opaco o transparente, resistente a los R-X, los ácidos, las bases, los aceites, las grasas y los alcoholes.	Termoplástico, flexible o rígido, opaco o transparente, resistente a los rayos X, los ácidos, las bases, los aceites, las grasas y los alcoholes.
Politetrafluoro etileno (PTFE) o teflón	Químicamente inerte, antiadherente, impermeable al agua y a las grasas, muy resistente al calor y a la corrosión.	Prótesis, juntas, piezas mecánicas en medios corrosivos, aislamiento eléctrico, revestimiento de sartenes.
Polimetacrilato de metilo (PMMA) o plexiglás	Termoplástico, transparente, excelentes propiedades ópticas, buena resistencia al envejecimiento y a la intemperie.	Material sustitutivo del vidrio, letreros luminosos, cristalerías, ventanillas, vitrinas, fibras ópticas, odontología, prótesis, lentes de contacto.
Poliamidas (PA) (ej: nailon)	Termoplástico, excelentes propiedades mecánicas, resistentes a los R-X y a los carburantes, impermeables a los olores y a los gases.	Envases para alimentos, mecanismos de contadores de agua, gas y electricidad, canalización de carburantes, botas y fijaciones de esquí, sillines de bicicleta.
Siliconas	Fluidas, lubricantes, antiadherentes, débilmente tóxicas.	Fluidos para transformadores eléctricos, masillas, revestimientos antiadherentes, barnices, ceras, tratamiento de quemaduras, cirugía estética.
Poliésteres	Termoendurecibles, transparentes, buenas propiedades mecánicas a T ^a elevadas, propiedades eléctricas, resistentes a los golpes, fáciles de mecanizar.	Productos textiles, envases, botellas, interruptores, tomas y fusibles para circuitos de alta tensión, prótesis.
Poliétertereftalato (PET)	Termoplástico, transparente, flexible.	Envases de bebidas.

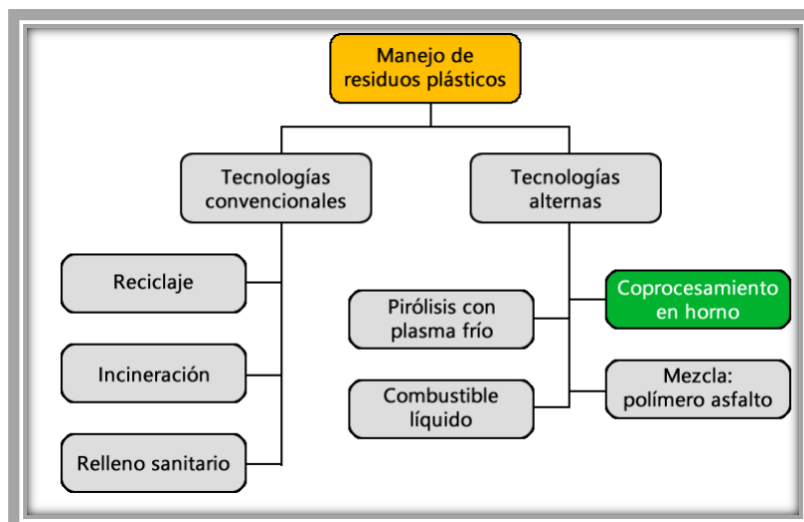
[6] Ciclo de vida del plástico

- Fuente: <https://twitter.com/hyssemjimenez/status/912517612751355904>



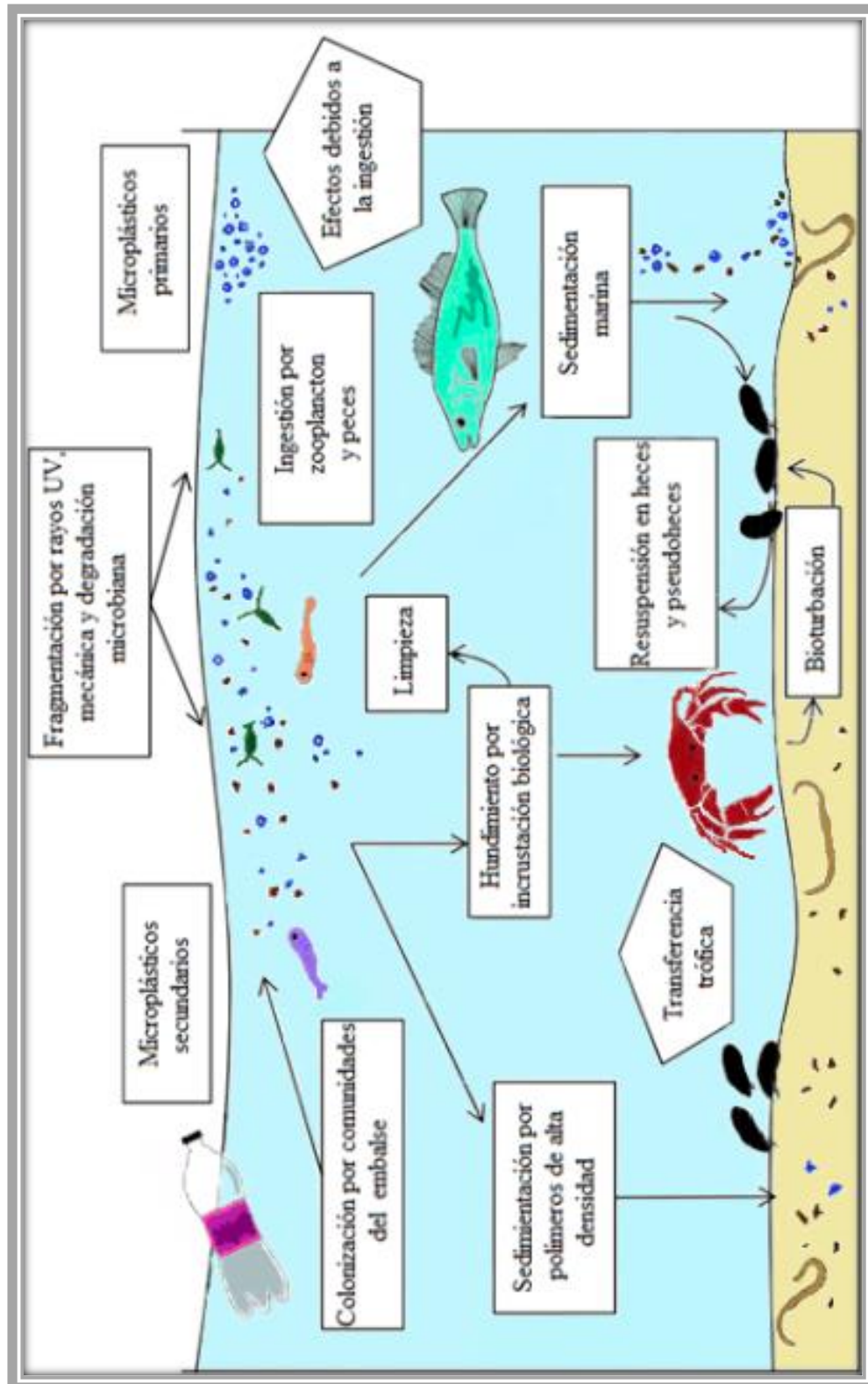
[8] Manejo de residuos plásticos

- Fuente: <https://coprocesamiento.org/disposicion-de-residuos-plasticos/>



[9] Principales mecanismos de difusión de los microplásticos e interacciones biológicas.

- Fuente: Wright et al., 2013 - <https://www.revistac2.com/plastico-que-tiras-al-agua/microplasticos-c2/>



[13] Legislación de la UE sobre los MPs agregados intencionadamente (2018)

- Fuente: <https://echa.europa.eu/documents/10162/05bd96e3-b969-0a7c-c6d0-441182893720>

Table 4: Overview of European regulatory action on intentionally added microplastics

Country	Ban on manufacture	Ban on placing on the market	Regulatory action overview
Belgium			Plan to ban plastic particles (microbeads) in all rinse-off cosmetic products and toothpastes by 2019.
France		X	Ban the placing on the market of rinse-off cosmetic products for exfoliation or cleaning that contain solid plastic particles (define as microbeads smaller than 5 mm made of plastic in whole or in part, obtained by a hot-shaping process). Exemption for particles of natural origins (i) not persisting in the environment, (ii) not releasing active or biologic substance, (iii) not affecting animal food chain Entry into force: 1 January 2018
Ireland	X	X	Plan to prohibit the manufacture and use of certain products containing plastic microbeads (rinse-off cosmetic products and household cleaning products). Public consultation in 2018. Not yet in force.
Italy		X	Ban the marketing of exfoliating rinse-off cosmetic products or detergents containing microplastics No exemption Entry into force: 1 July 2020
Sweden		X	Ban the placing on the market of cosmetic products that are intended to be rinsed off or spat out and contain microplastics (defined as 'solid plastic particles that are smaller than 5 mm in any dimension and insoluble in water') which have been added to cleanse, exfoliate or polish. Exemption might be given to microplastics that have been manufactured using naturally occurring polymers as a raw material, are quickly broken down into monomers in the aquatic environment, and do not pose any risk to aquatic organisms Entry into force: July 2018
United Kingdom	X	X	Ban the use of microbeads (defined as 'any water-insoluble solid plastic particle of less than or equal to 5mm in any dimension') as an ingredient in the manufacture of rinse-off personal care products and the sale of any such products containing microbeads. Entry into force: January 2018 (manufacturing), and June 2018 (sales)

Source: SAM (2018), internet searches

Legislación sobre los MPs agregados intencionadamente fuera de la UE (2018)

- Fuente: <https://echa.europa.eu/documents/10162/05bd96e3-b969-0a7c-c6d0-441182893720>

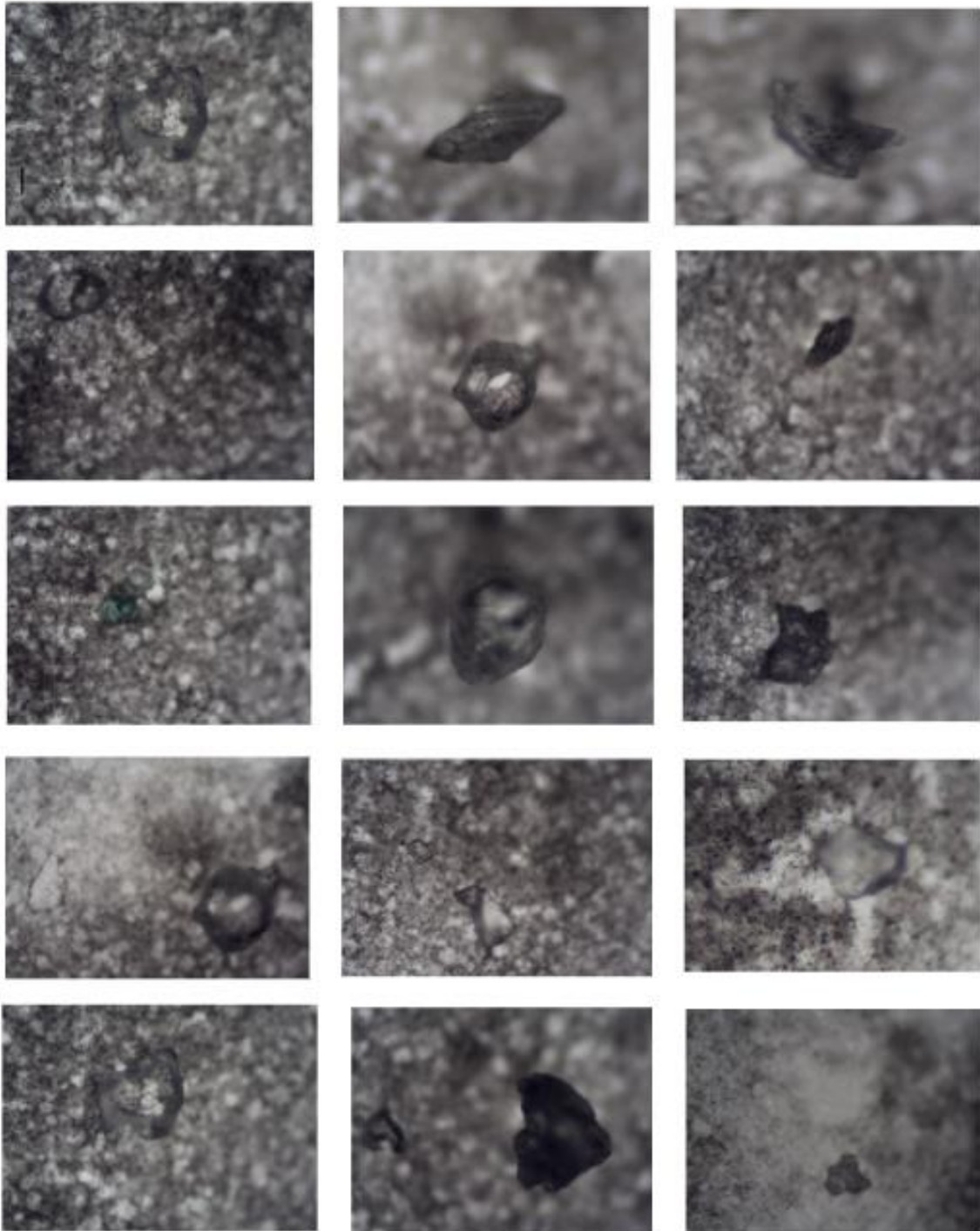
Table 5: Overview of non-EU regulatory action on intentionally added microplastics

Country	Ban on manufacture	Ban on placing on the market	Regulatory action overview
Australia			Voluntary actions from industry on-going
Brazil			Intention to ban the manufacturing and placing of the market of personal care products containing microbeads.
Canada	X	X	Ban on the manufacturing, import, and placing on the market of any toiletries (including natural health product and non-prescription drug) for cleansing or hygiene that contain microbeads. Entry into Force: 1 July 2018
India			Intention to ban the use of microbeads as ingredients in cosmetics, household laundry detergent bars, synthetic detergents for washing woollen and silk fabrics, synthetic detergents for industrial purposes, and household laundry detergent powders.
New-Zealand	X	X	Ban on the manufacturing and placing of the market of wash-off products containing microplastics with the purposes of exfoliation, cleaning, abrasive cleaning or visual appearance of the product (e.g. . exfoliating and cleaning cosmetics, abrasive cleaning products, car and industrial cleaning products). Exemption: medical devices and medicines Entry into Force: 7 June 2018
Republic of Korea	X	X	Ban on the manufacturing and placing of the market of cosmetics and sanitary aids (gargle, toothpaste and teeth whitening) containing microplastics. Entry into Force: 19 May 2017 (sanitary aids) and 1 July 2017 (cosmetics)
United States of America	X	X	Ban on the manufacturing and placing of the market of rinse-off products with exfoliating or cleansing function on the human body or any part thereof. Exemption: drugs that are not also cosmetics Entry into Force for rinse-off cosmetics: 1 July 2017 (manufacturing), and 1 July 2018 (sales) Entry into Force for rinse-off cosmetics that are also non-prescription drugs: 1 July 2018 (manufacturing), and 1 July 2019 (sales)

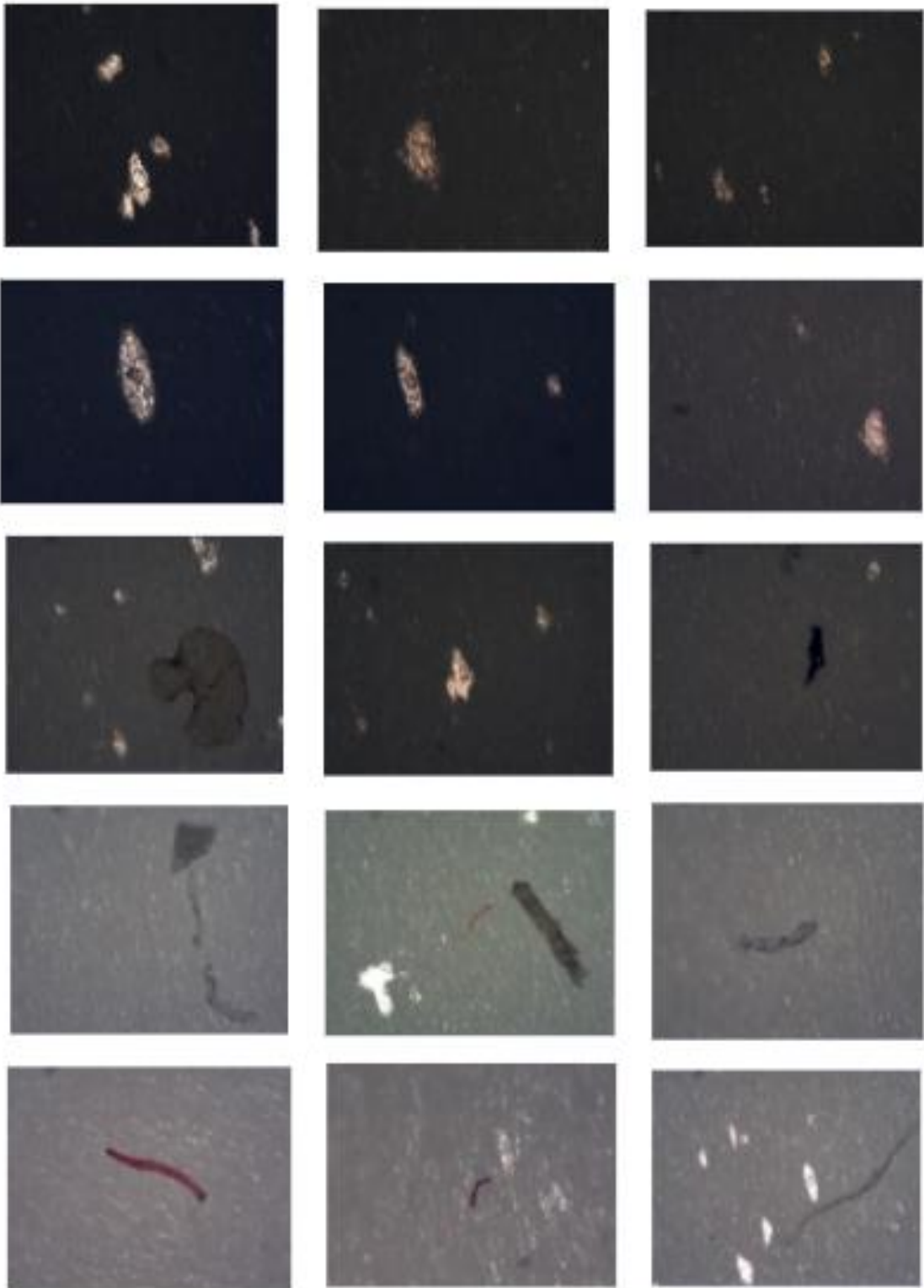
Source: United Nations Environment Program (2018), internet searches

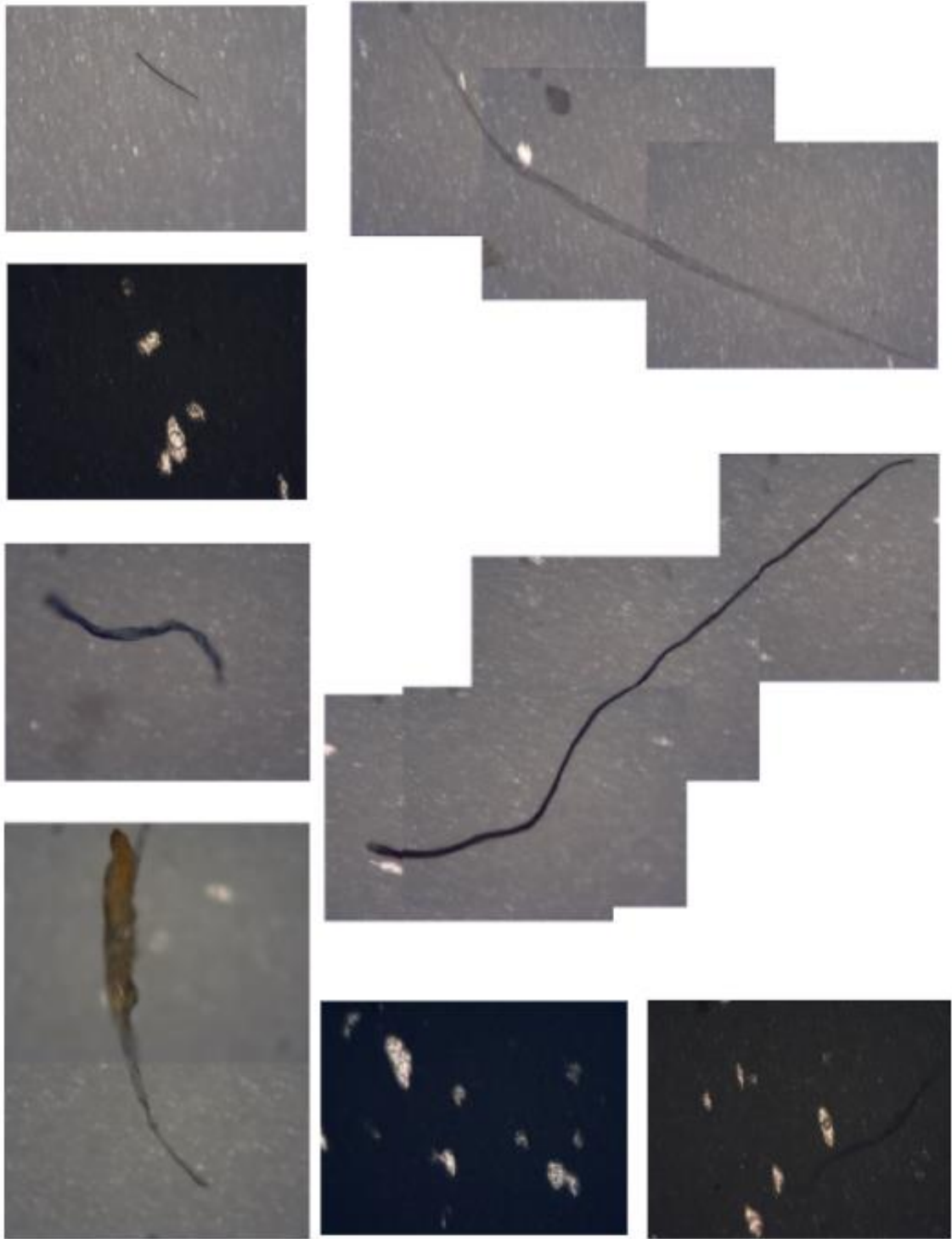
[15] Partículas detectadas en cada muestra

MUESTRA A

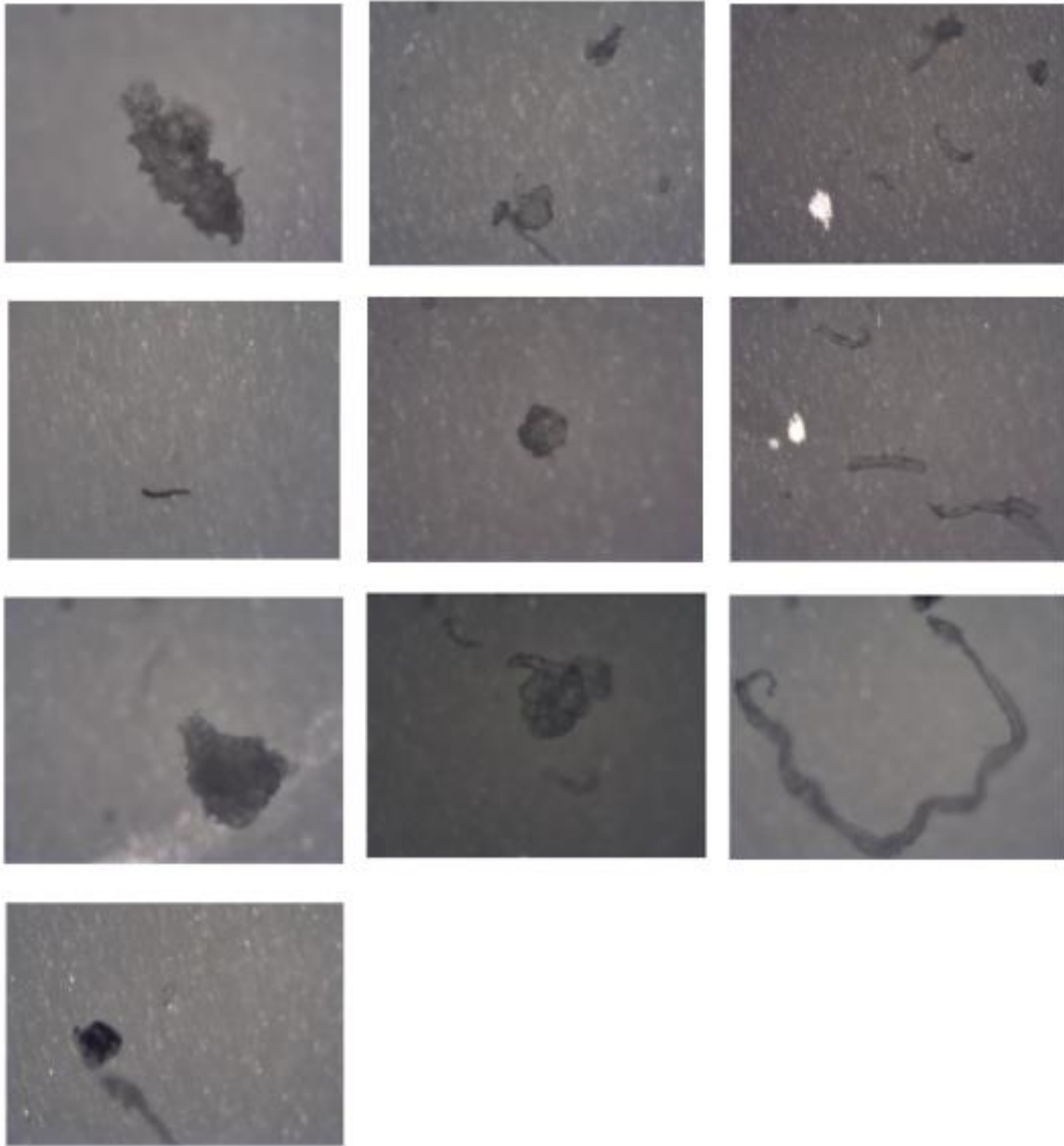


MUESTRA B

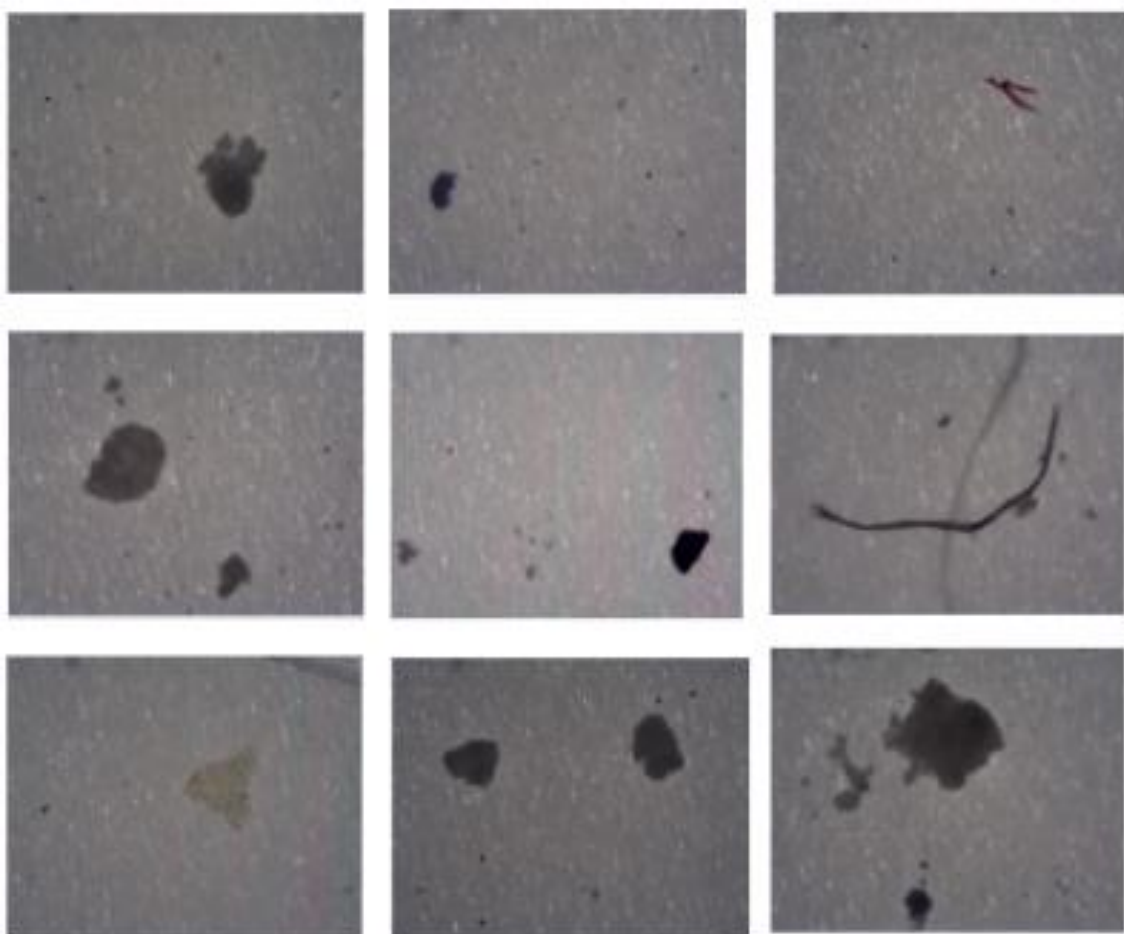




MUESTRA C



MUESTRA D

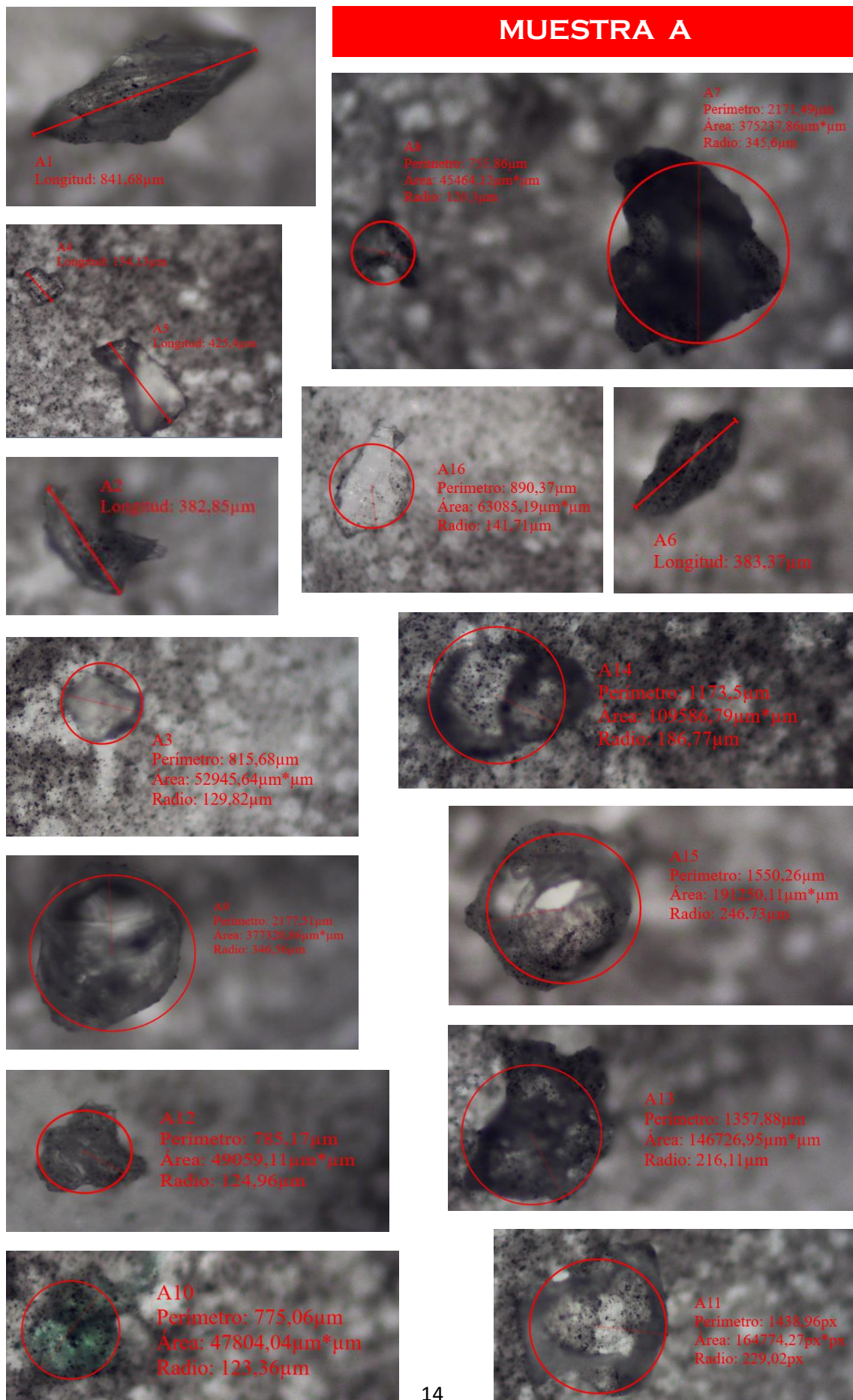


[16] Tabla de los resultados obtenidos

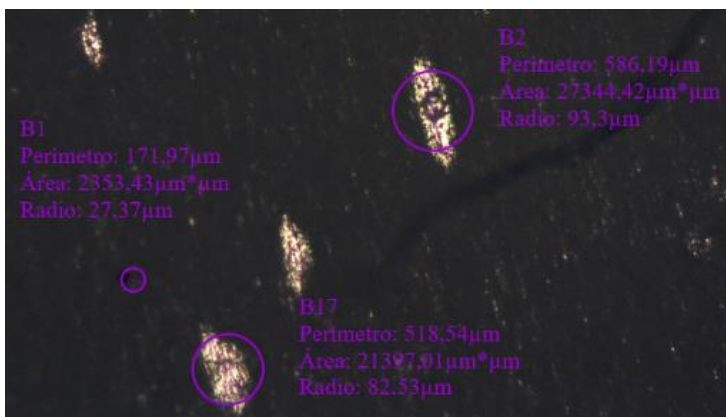
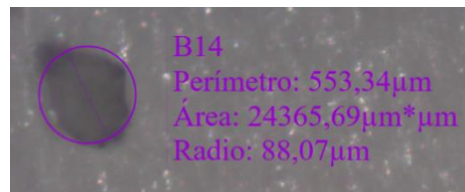
	MUESTRAS				
	FILTRO	A	B	C	D
MASA (g)	0,041	0,051	0,042	0,043	0,042
MASA Partículas (g)	0	0,01	0,001	0,002	0,001

Muestra	A	B	C	D	
Radio (μm)	1)	120,3	88,07	91,63	19,53
	2)	345,6	27,55	79,03	34,63
	3)	212,7	67,45	47,06	16,2
	4)	141,71	27,37	35,96	19,46
	5)	129,82	51,65	45,51	218,6
	6)	216,11	107,57	117,19	156
	7)	123,36	110,9	17,98	167,51
	8)	124,96	67,3	16,79	56,57
	9)	346,56	60,2	47,57	104,09
	10)	77,065	66,05	42,6	91,93
Rango de tamaños	77,065-346,56	27,37-110,9	16,79-117,19	16,2-218,6	
Radio medio (μm)	183,82	67,41	54,13	88,45	
Radio medio (cm)	0,018382	0,006741	0,005413	0,008845	
V_t (cm^3)	0,01064	0,001064	0,002128	0,001064	
M_t (g)	0,010	0,001	0,002	0,001	
V_p (cm^3)	$2,602 \cdot 10^{-5}$	$1,283 \cdot 10^{-6}$	$6,644 \cdot 10^{-7}$	$2,899 \cdot 10^{-6}$	
Nº partículas/g	408,92	829,31	3202,89	367,02	
% masa	20	2	4	2	

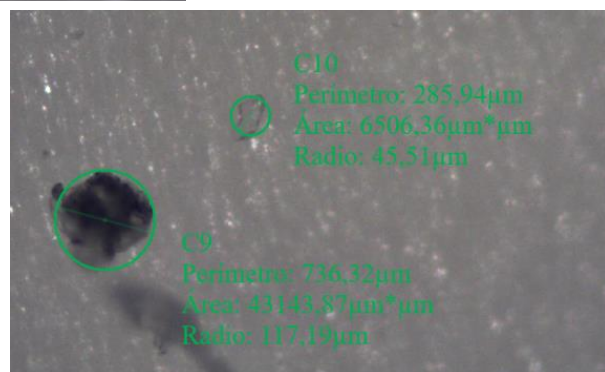
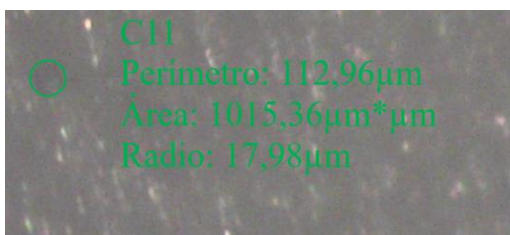
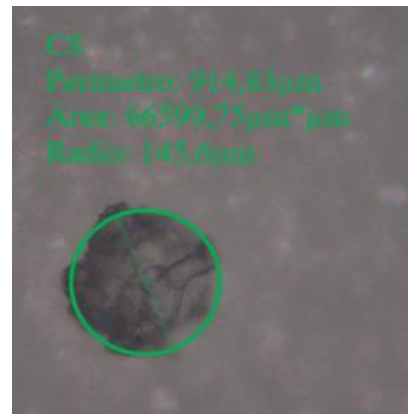
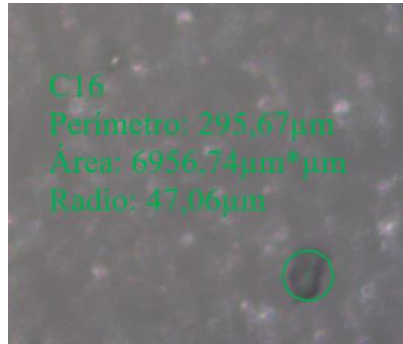
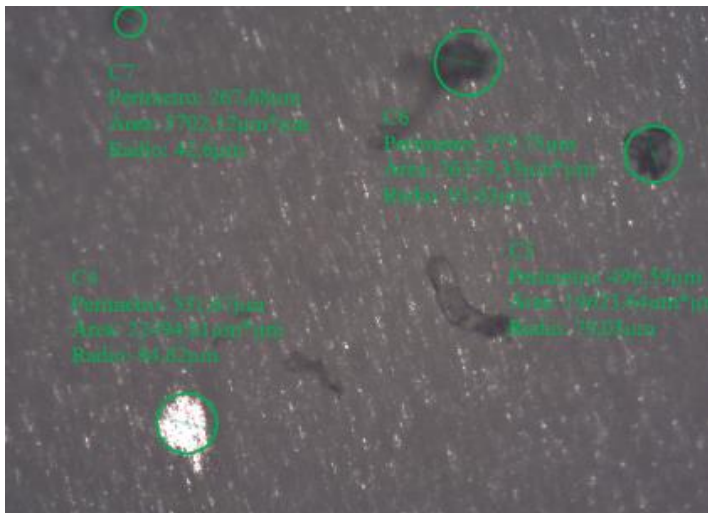
[17] Radios de posibles MPs detectados



MUESTRA B



MUESTRA C



MUESTRA D

