

Supporting information

Annealing assisted optimization in persistency of afterglow of $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+}/\text{Dy}^{3+}$ micro particles for forensic detections

Abhishek Kumar^{1,2*}, Diana M.A. Crista^{1,3}, Ara Núñez-Montenegro^{1,3}, Joaquim C.G. Esteves da Silva¹ and

Santosh Kumar Verma⁴

¹Chemistry Research Unit (CIQUP), Institute of Molecular Sciences (IMS), Departamento de Geociências, Ambiente e Ordenamento do Território, Faculdade de Ciências, Universidade do Porto, Rua do Campo Alegre s/n, Porto 4169-007, Portugal

² Department of Physics & Electronics, Kamla Nehru Institute of Physical and Social Sciences (KNIPSS), Sultanpur, Uttar Pradesh- 228118, India

³Ferreira Martins & Filhos – Madeiras e Derivados, S.A. R. Pinheiro 3, 4710-348 Braga, Portugal.

⁴School of chemistry and chemical engineering, yulin university, yulin city. 719000

Table S1: values of colour coordinates and corresponding colour purities of different annealed samples.

Sample	x-coordinate	y-coordinate	Colour purity
1100°C	0.2618	0.3610	22.6 %
1200°C	0.2650	0.4159	21.1 %
1300°C	0.2700	0.5107	38.1 %
1400°C	0.2794	0.5294	45.1 %
1500°C	0.2779	0.5603	54.1 %

Table S2: The variation of emission intensity with time.

Time of persistency (minute)	1100°C	1200°C	1300°C	1400°C	1500°C
0	60	70	260	450	990
3	2.9	4	4.1	30	70
5	1.7	1.9	2.3	12	37
10	0.76	0.81	1.1	4.3	19
15	0.40	0.56	0.58	2.8	10.9
20	0.29	0.40	0.42	1.9	7.74
25	0.21	0.30	0.32	1.28	6.18
30	0.16	0.22	0.25	0.99	5.09
35	0.13	0.20	0.23	0.8	4.32
40	0.10	0.16	0.18	0.66	3.76
45	0.09	0.14	0.15	0.56	3.31
50	0.07	0.11	0.12	0.48	2.94
55	0	0.08	0.09	0.41	2.65
60	0	0.07	0.07	0.37	2.41
90	0	0	0	0.20	1.54
120	0	0	0	0.11	1.11
150	0	0	0	0.07	0.88
180	0	0	0	0	0.69
210	0	0	0	0	0.58
240	0	0	0	0	0.49
270	0	0	0	0	0.43

300	0	0	0	0	0.38
330	0	0	0	0	0.33
360	0	0	0	0	0.30
390	0	0	0	0	0.27
420	0	0	0	0	0.23
450	0	0	0	0	0.22
480	0	0	0	0	0.19
510	0	0	0	0	0.18
540	0	0	0	0	0.17
600	0	0	0	0	0.15
700	0	0	0	0	0.13
800	0	0	0	0	0.12
900	0	0	0	0	0.11
1000	0	0	0	0	0.10
1150	0	0	0	0	0.09
1250	0	0	0	0	0.08
1440	0	0	0	0	0.07

Table S3: Chemical composition of the sweat secretion [1]

Secretory glands	Location	Inorganic constituents	Organic constituents
Eccrine glands	All over the body, especially on the palms of hands and soles of feet	Metal ions sulphate phosphate, Bicarbonates, Ammonia Water (>98%)	Creatinine choline, Urea, Uric acid, Lactic acid, Sugars, Amino acids and Proteins
Apocrine glands	In the grain and the armpits; associated with hair follicles	Water (>98%)	Proteins, carbohydrate and Sterols
Sebaceous glands	All over the body, highest concentration is on the forehead and on the back	Ions	Glycerides Fatty acids Wax esters Sterol esters Sterols Squalene

References

1. A. Arshad, M. A. Farrukh, S. Ali, M. K. Rahman, M. A. Tahir, J. Forensic Sci., 60 (2015) 1182.