Electronic Supporting Information

## Oxamate salts as novel agents for the restoration of marble and limestone substrates: case study of ammonium *N*-phenyloxamate

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Formula C8 H10 N2 O3 182.18 Formula Weight Monoclinic Crystal System P21/c Space group (No. 14) a, b, c [Angstrom] 18.927(6) 6.364(2) 7.380(3) alpha, beta, gamma [deg] 90 93.784(8) 90 V [Ang\*\*3] 887.0(5) 4 Ζ D(calc) [g/cm\*\*3]1.364 Mu(CuKa) [ /mm ] 0.897 F(000) 384 Crystal Size [mm] 0.01 x 0.10 x 0.15 Data Collection Temperature (K) 125 Radiation [Angstrom] CuKa 1.54187 Theta Min-Max [Deg] 4.7, 68.8 -22: 22 ; -7: 7 ; -8: 8 Dataset Tot., Uniq. Data, R(int) 8449, 1596, 0.167 Observed data [I > 0.0 sigma(I)] 1290 Refinement Nref, Npar 1596, 138 R, wR2, S 0.1491, 0.4063, 1.26 Max. and Av. Shift/Error 0.00, 0.00 -0.42, 0.63 Min. and Max.Resd. Dens. [e/Ang^3]  $= \sqrt{S^2^{(FO^2^)} + (0.1775P)^2^{+4.1276P}}, \quad \text{where} \quad P = (FO^2^{+2FC^2^)}/3'$ 

Table S1. Crystal data and details of the structure determination for AmPhOxam.

W

Atom	Х	У	Z	U(eq) [Ang^2]	
01	0.4413(3)	0.3112(8)	0.5628(7)	0.0425(17)	
02	0.3361(3)	0.5728(7)	0.4267(7)	0.0401(17)	
010	0.3730(3)	0.0357(7)	0.4750(7)	0.0381(17)	
N3	0.2724(3)	0.2855(9)	0.3257(8)	0.0335(17)	
C1	0.3866(3)	0.2274(10)	0.4892(8)	0.0303(19)	
C2	0.3295(4)	0.3821(10)	0.4093(9)	0.0304(19)	
C4	0.2107(4)	0.3917(11)	0.2527(8)	0.033(2)	
C5	0.2153(4)	0.5838(11)	0.1611(9)	0.034(2)	
C6	0.1535(4)	0.6813(12)	0.0947(9)	0.040(2)	
C7	0.0882(4)	0.5947(14)	0.1194(10)	0.046(3)	
C8	0.0840(4)	0.4035(15)	0.2075(11)	0.049(3)	
С9	0.1451(4)	0.3027(12)	0.2740(10)	0.041(2)	
Nl	0.4373(3)	-0.2769(8)	0.7047(7)	0.0271(16)	

**Table S2.** Final coordinates and equivalent isotropic displacement parameters of the non-hydrogen atoms for AmPhOxam.

U(eq) = 1/3 of the trace of the orthogonalized U Tensor

	Atom	Х	У	z U	(iso) [Ang^2]	
	НЗ	0.274(4)	0.1319(16)	0.318(13)	0.05(2)	
	Н5	0.26009	0.64593	0.14481	0.0412	
	Нб	0.15622	0.81045	0.03097	0.0484	
	Н7	0.04630	0.66572	0.07615	0.0548	
	H8	0.03909	0.34150	0.22243	0.0584	
	Н9	0.14196	0.17161	0.33451	0.0485	
	H1A	0.419(5)	-0.161(11)	0.629(13)	0.07(3)	
	H1B	0.403(3)	-0.308(15)	0.793(9)	0.06(3)	
	H1C	0.436(5)	-0.387(11)	0.612(10)	0.06(3)	
	H1D	0.4870(14)	-0.263(13)	0.750(11)	0.04(2)	
The	Temperatur	e Factor	has the	Form of	Exp(-T) Where	т =

 Table S3. Hydrogen atom positions and isotropic displacement parameters for AmPhOxam.

The Temperature Factor has the Form of 8\*(Pi\*\*2)\*U\*(Sin(Theta)/Lambda)\*\*2 for Isotropic Atoms

At	om (	U(1,1) or U	U(2,2)	U(3,3)	U(2,3)	U(1,3)	U(1,2)
01		0.050(3)	0.035(3)	0.041(3)	-0.001(2)	-0.009(2)	0.002(2)
02		0.058(3)	0.022(3)	0.039(3)	0.003(2)	-0.007(2)	-0.003(2)
01	0	0.057(3)	0.022(3)	0.035(3)	0.0032(19)	0.001(2)	0.003(2)
N3		0.047(3)	0.025(3)	0.028(3)	0.001(2)	-0.002(2)	-0.002(2)
C1		0.046(4)	0.026(3)	0.019(3)	0.002(2)	0.002(3)	0.002(3)
C2		0.047(4)	0.024(3)	0.020(3)	0.003(2)	0.001(3)	-0.001(3)
C4		0.047(4)	0.032(4)	0.018(3)	-0.004(2)	-0.001(3)	0.002(3)
C5		0.052(4)	0.030(4)	0.021(3)	-0.003(3)	0.002(3)	0.000(3)
C6		0.059(4)	0.036(4)	0.025(3)	-0.001(3)	-0.003(3)	0.007(3)
C7		0.053(4)	0.057(5)	0.027(4)	-0.004(3)	-0.001(3)	0.013(4)
C8		0.045(4)	0.065(6)	0.036(4)	0.004(4)	0.004(3)	-0.006(4)
C9		0.054(4)	0.041(4)	0.026(3)	0.003(3)	-0.001(3)	-0.005(3)
N1		0.039(3)	0.022(3)	0.020(2)	0.002(2)	0.000(2)	-0.001(2)

Table S4. (An)isotropic displacement parameters for AmPhOxam.

The Temperature Factor has the Form of Exp(-T) Where T = 8\*(Pi\*\*2)\*U\*(Sin(Theta)/Lambda)\*\*2 for Isotropic Atoms, T = 2\*(Pi\*\*2)\*Sumij(h(i)\*h(j)\*U(i,j)\*Astar(i)\*Astar(j)), for Anisotropic Atoms. Astar(i) are Reciprocal Axial Lengths and h(i) are the Reflection Indices.

01	-C1	1.256(8)	C4	-C5	1.403(10)
02	-C2	1.226(8)	C4	-C9	1.383(11)
010	-C1	1.250(8)	С5	-C6	1.385(11)
N3	-C2	1.356(9)	C6	-C7	1.376(11)
N3	-C4	1.424(9)	C7	-C8	1.384(13)
N3	-НЗ	0.980(13)	C8	-C9	1.384(11)
Nl	-H1D	0.98(4)	С5	-Н5	0.9500
N1	-H1B	0.97(6)	C6	-Н6	0.9500
Nl	-H1A	0.98(8)	C7	-H7	0.9500
Nl	-H1C	0.98(7)	C8	-H8	0.9500
C1	-C2	1.550(9)	С9	-Н9	0.9500

 Table S5. Bond distances (Angstrom) for AmPhOxam.

 C2	-N3	-C4	124.5(6)	С5	-C4	-C9	119.8(7)
C4	-N3	-НЗ	119(5)	C4	-C5	-C6	118.9(7)
C2	-N3	-НЗ	117(5)	C5	-C6	-C7	121.2(7)
H1B	-N1	-H1D	117(6)	C6	-C7	-C8	119.6(7)
H1A	-N1	-H1D	115(7)	C7	-C8	-C9	120.1(7)
H1C	-N1	-H1D	106(7)	C4	-C9	-C8	120.4(7)
H1A	-N1	-H1C	99(7)	C4	-C5	<b>-</b> H5	121.00
H1A	-N1	-H1B	108(8)	C6	-C5	<b>-</b> H5	121.00
H1B	-N1	-H1C	110(7)	C5	-C6	-Н6	119.00
010	-C1	-C2	117.0(5)	C7	-C6	-Н6	119.00
01	-C1	-C2	115.4(6)	C8	-C7	-Н7	120.00
01	-C1	-010	127.6(6)	C6	-C7	-H7	120.00
02	-C2	-C1	121.7(6)	C7	-C8	-H8	120.00
02	-C2	-N3	124.7(7)	С9	-C8	-H8	120.00
N3	-C2	-C1	113.6(5)	C8	-C9	-Н9	120.00
N3	-C4	-C5	121.4(7)	C4	-C9	-Н9	120.00
N3	-C4	-C9	118.9(6)				

 Table S6. Bond angles (Degrees) for AmPhOxam.

-2.7(11)	-02	-C2	-N3	C 4
175.4(6)	-C1	-C2	-N3	C4
39.4(10)	-C5	-C4	-N3	C2
-140.3(7)	-C9	-C4	<b>-</b> N3	C2
-4.0(9)	-02	-C2	-C1	01
177.9(6)	<b>-</b> N3	-C2	-C1	01
175.4(6)	-02	-C2	-C1	010
-2.8(8)	<b>-</b> N3	-C2	-C1	010
-179.3(6)	-C6	-C5	-C4	N3
0.4(10)	-C6	-C5	-C4	С9
178.9(7)	-C8	-C9	-C4	N3
-0.8(11)	-C8	-C9	-C4	C5
1.0(10)	-C7	-C6	-C5	C4
-1.9(11)	-C8	-C7	-C6	C5
1.5(12)	-C9	-C8	-C7	C6
-0.1(12)	-C4	-C9	-C8	C7

 Table S7. Torsion angles (Degrees) for AmPhOxam.

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$							
01 .N1_a 2.826(7) N1 .O1_o 3.134(8) 01 .N1_b 2.832(8) N1 .O2_d 2.908(8) 01 .N1_b 2.832(8) N1 .O1_h 2.826(7) 02 .N1_a 2.877(8) N1 .O2_h 2.877(8) 02 .N1_f 2.908(8) N1 .O1_h 2.826(7) 02 .O1_c 3.043(7) N1 .O1_h 2.837(8) 02 .O1_c 3.043(7) N1 .O1_h 2.837(8) 02 .O1_c 3.043(7) N1 .O1_n 2.832(8) 02 .O1_c 2.735(8) N3 .O1_ 2.663(8) 02 .O1_c 2.735(8) N3 .O1_ 2.663(8) 02 .O1_c 2.653(8) C1 .N3_d 3.399(8) 010 .N3 2.663(8) C1 .N3_d 3.399(8) 010 .N1_1 2.836(7) C1 .O1_j 3.398(8) 010 .N1_ 2.836(7) C2 .O1_j 3.422(9) 010 .N1_ 2.836(7) C2 .O1_j 3.422(9) 010 .O2_h 3.043(7) C2 .O1_j 3.422(9) 010 .C2_d 3.402(9) C2 .O1_j 3.402(9) 01 .H1_c 2.777(7) C1 .H1_b 2.3.07(5) 01 .H1_b 1.93(6) C1 .H1_b 3.06(9) 01 .H1_c 2.777(9) C2 .H1_a 2.78(8) 02 .H1_a 2.269(9) C1 .H1_a 2.77(8) 02 .H1_a 2.277(9) C2 .H1_a 2.78(7) 02 .H1_a 2.277(9) C2 .H1_a 2.78(8) 02 .H1_a 2.277(9) C2 .H1_a 2.84(8) 02 .H1_a 2.277(9) C3 .H2_a 2.84(8) 02 .H1_a 2.277(9) C3 .H2_a 2.84(8) 02 .H1_a 2.277(9) C2 .H1_a 2.78(7) 02 .H1_a 2.27(9) C2 .H1_a 2.78(7) 02 .H1_a 2.27(9) C3 .H2_a 2.84(8) 02 .H1_a 2.27(9) C3 .H2_a 2.84(8) 02 .H1_a 2.22(8) C4 .H1_a 2.73(8) 02 .H1_a 2.22(8) C5 .H6_g 3.0300 02 .H1_a 2.22(8) C6 .H9_j 2.9500 010 .H1_a 1.87(9) C7 .H9_j 2.9500 010 .H1_a 1.87(9) C7 .H9_j 2.9500 010 .H1_a 1.87(9) C7 .H9_j 2.9500 010 .H1_a 1.87(9) H1D .C1_n 2.97(6) H1A .O2_h 2.69(9) H1D .C1_n 2.97(6) H1A .O2_h 2.484(8) H7 .H9_j 2.5200 H1B .01_p 2.08(8) H5 .O2_k 2.8600 H1B .01_p 2.08(8) H5 .O2_k 2.9800 H1B .01_p 2.08(8) H5 .O2_k 2.9800 H1C .O2_h 2.77(7) H8 .H7_m 2.5300 H1C .O1_n 1.96(7) H9 .C6_d 2.9500 H1C .O1_n 1.96(7) H9 .C6_d 2.9500 H1D .O1_n 1.96(7) H9 .C6_d 2.9500 H1D .O1_n 1.96(7) H9 .C6_d 2.9500 H1D .O1_n 1.93(6) H9 .C6_d 2.9500 H1D .O1_n 1.93(6) H9 .C6_d 2.9500 H1D .O1_n 1.93(6) H9 .C6_d 2.	01	.02	2.735(8)	010	.H5_d	2.8000	
01 .N1_c 3.134(8) N1 .02_d 2.908(8) 01 .N1_b 2.832(8) N1 .01_p 2.914(7) 01 .C1_d 3.386(8) N1 .01_h 2.826(7) 02 .N1_a 2.877(8) N1 .02_h 2.877(8) 02 .N1_f 2.908(8) N1 .01_n 2.832(8) 02 .01_e 3.043(7) C1 .01_j 3.399(8) 010 .N3 2.663(8) C1 .N3_d 3.399(8) 010 .N1_i 2.836(7) C1 .01_j 3.399(8) 010 .N1_i 2.836(7) C1 .01_j 3.866(8) 010 .02_h 3.043(7) C2 .C1_j 3.422(9) 010 .02_h 3.043(7) C2 .01_j 3.402(9) 010 .02_h 3.043(7) C2 .01_j 3.402(9) 01 .11_c 2.77(7) C5 .02 2.913(9) 01 .11_c 2.77(7) C1 .11_b 2.97(6) 01 .11_c 3.06(9) 01 .11_c 3.06(9) 01 .11_c 3.06(9) 01 .11_c 3.06(9) 01 .11_c 3.286(9) C1 .11_b 3.06(9) 01 .11_c 3 1.96(7) C1 .11_b 2.97(6) 02 .11_a 4.2.27(9) C2 .11_c 3.276(7) 02 .11_a 7.2.28(8) C5 .16_g 3.0930 02 .11_a 7.2.22(8) C6 .19_j 2.9500 010 .11_b 1.2.22(8) C6 .19_j 2.9500 010 .11_b 1.2.08(8) C8 .19_j 3.0700 11A .02_h 2.28(9) H1D .C1_n 2.97(6) 11A .02_h 2.69(9) H1D .C1_n 2.97(6) 11A .02_d 2.84(9) H3 .010 2.22(8) H1A .010 1.87(9) H5 .C2 2.8300 H1B .010_p 2.08(8) H5 .02_k 2.8600 H1B .010_p 2.08(6) H5 .02_k 2.8600 H1D .01_n 1.96(7) H9 .C6_d 2.9500 H1C .02_h	01	.N1_a	2.826(7)	Nl	.01_0	3.134(8)	
01 .N1_b 2.832(8) N1 .O1_p 2.914(7) 01 .C1_d 3.36(8) N1 .O1_h 2.826(7) 02 .N1_a 2.877(8) N1 .O1_h 2.836(7) 02 .O1_e 3.043(7) N1 .O1_n 2.832(8) 02 .O1 2.735(8) N3 .O1O 2.663(8) 02 .C5 2.913(9) N3 .C1_j 3.399(8) 010 .N3 2.663(8) C1 .N3_d 3.399(8) 010 .N1 2.9663(8) C1 .O1_j 3.86(8) 010 .N1 2.836(7) C1 .O1_j 3.86(8) 010 .O2_h 3.043(7) C2 .O1_j 3.422(9) 010 .C2_d 3.402(9) C2 .O1_j 3.422(9) 010 .C2_d 3.402(9) C2 .O1_j 3.422(9) 010 .H1_C 2.77(7) C1 .H1D_C 3.07(5) 01 .H1D_C 2.77(7) C1 .H1D_C 3.07(5) 01 .H1C_a 1.96(7) C1 .H1A 2.73(8) 02 .H1A_f 2.849(9) C1 .H1A 2.73(8) 02 .H1A_f 2.849(9) C1 .H1A 2.76(7) 02 .H1A_f 2.849(9) C2 .H1C_a 2.84(8) 02 .H1B_f 2.23(8) C5 .HE_g 3.0900 01 .H1D_C 2.77(7) C2 .H1C_a 2.84(8) 02 .H1B_f 2.23(8) C3 .HE_g 3.0900 010 .H1A 1.87(9) C7 .H9_j 2.9500 010 .H1A 0.2_h 2.69(9) H1D .C1_o 3.07(5) H1A .O2_h 2.69(9) H1D .C1_o 3.07(5) H1A .O2_h 2.69(9) H1D .C1_o 3.07(5) H1A .O2_h 2.23(8) C5 .HE_g 3.0900 010 .H1B_i 2.08(8) C8 .H9_j 2.9500 010 .H1B_i 2.08(8) C8 .H9_j 2.9500 H1A .O1O 1.87(9) H1D .C1_o 3.07(5) H1A .O2_h 2.69(9) H1D .C1_o 3.07(5) H1A .O2_h 2.23(8) H5 .O2_L 2.8300 H1B .O1O_p 2.08(8) H5 .O2_L 2.9500 H1D .O1_O 2.77(9) H8 .H7_m 2.5300 H1C .O2_h 2.27(9) H9 .H3 .25300 H1C .O2_h 2.27(9) H9 .H3 .25300 H1D .O1_O 0.277(9) H9 .C5_d 2.9500 H1D .O1_N 2.77(9) H9 .C5_d 2.9500 H1D .O1_N 2.77(9) H9 .C5_d 2.9500 H1D .O1_N 2.77(9) H9 .C5_d 2.950	01	.N1_c	3.134(8)	N1	.02_d	2.908(8)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.N1_b	2.832(8)	N1	.010_p	2.914(7)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.C1_d	3.386(8)	N1	.01_h	2.826(7)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.N1_a	2.877(8)	N1	.02_h	2.877(8)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.N1_f	2.908(8)	N1	.010	2.836(7)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.010_e	3.043(7)	N1	.01_n	2.832(8)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.01	2.735(8)	NЗ	.010	2.663(8)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.C5	2.913(9)	NЗ	.C1_j	3.399(8)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	010	.N3	2.663(8)	C1	.N3_d	3.399(8)	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	010	.N1_i	2.914(7)	C1	.C2_d	3.422(9)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	010	.N1	2.836(7)	C1	.01_j	3.386(8)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	010	.02 h	3.043(7)	C2	.C1 j	3.422(9)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	010	.C2_d	3.402(9)	C2	.010_j	3.402(9)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.H1C_c	2.77(9)	С5	.02	2.913(9)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.H1D_c	2.77(7)	C1	.H1D_c	3.07(5)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.H1D b	1.93(6)	C1	.H1B i	3.06(9)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	01	.H1C a	1.96(7)	C1	.H1D b	2.97(6)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.H1A f	2.84(9)	C1	.H1A	2.73(8)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	02	.H1A_a	2.69(9)	C1	.H1C_a	2.76(7)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.H1C_a	2.27(9)	C2	.H1C_a	2.84(8)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.H5	2.4900	C2	.H5	2.8300	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	02	.H5_g	2.8600	C4	.H6_g	3.0300	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	02	.H1B_f	2.23(8)	C5	.H6_g	3.0900	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	010	.H3	2.22(8)	C6	.Н9_ј	2.9500	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	010	.H1A	1.87(9)	С7	.Н9_ј	2.9300	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	010	.H1B_i	2.08(8)	C8	.Н9_ј	3.0700	
H1A       .C1       2.73(8)       H1D       .C1_o       3.07(5)         H1A       .02_d       2.84(9)       H3       .010       2.22(8)         H1A       .H1B_i       2.49(12)       H3       .H9       2.5200         H1A       .010_p       1.87(9)       H5       .C2       2.8300         H1B       .010_p       2.08(8)       H5       .02_k       2.8600         H1B       .C1_p       3.06(9)       H5       .02       2.4900         H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9300         H1D	H1A	.02_h	2.69(9)	H1D	.C1_n	2.97(6)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	H1A	.C1	2.73(8)	H1D	.C1_o	3.07(5)	
H1A       .H1B_i       2.49(12)       H3       .H9       2.5200         H1A       .010       1.87(9)       H5       .C2       2.8300         H1B       .010_p       2.08(8)       H5       .02_k       2.8600         H1B       .C1_p       3.06(9)       H5       .02_k       2.4900         H1B       .C1_p       3.06(9)       H5       .02_k       2.8000         H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .02_d       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9300         H1D	H1A	.02_d	2.84(9)	HЗ	.010	2.22(8)	
H1A       .010       1.87(9)       H5       .C2       2.8300         H1B       .010_p       2.08(8)       H5       .02_k       2.8600         H1B       .C1_p       3.06(9)       H5       .02       2.4900         H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .01_o       2.77(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1A	.H1B_i	2.49(12)	HЗ	.H9	2.5200	
H1B       .010_p       2.08(8)       H5       .02_k       2.8600         H1B       .C1_p       3.06(9)       H5       .02       2.4900         H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300	H1A	.010	1.87(9)	H5	.C2	2.8300	
H1B       .C1_p       3.06(9)       H5       .O2       2.4900         H1B       .O2_d       2.23(8)       H5       .O10_j       2.8000         H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .O2_h       2.27(9)       H9       .H3       2.5200         H1C       .O1_h       1.96(7)       H9       .C6_d       2.9500         H1D       .O1_o       2.77(7)       H9       .C7_d       2.9300         H1D       .O1_n       1.93(6)       H9       .C8_d       3.0700	H1B	.010_p	2.08(8)	H5	.02_k	2.8600	
H1B       .02_d       2.23(8)       H5       .010_j       2.8000         H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1B	.C1_p	3.06(9)	H5	.02	2.4900	
H1B       .H1A_q       2.49(12)       H6       .C4_k       3.0300         H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1B	.02_d	2.23(8)	H5	.010_j	2.8000	
H1C       .C1_h       2.76(7)       H6       .C5_k       3.0900         H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1B	.H1A_q	2.49(12)	НG	.C4_k	3.0300	
H1C       .C2_h       2.84(8)       H7       .H8_1       2.5300         H1C       .O1_o       2.77(9)       H8       .H7_m       2.5300         H1C       .O2_h       2.27(9)       H9       .H3       2.5200         H1C       .O1_h       1.96(7)       H9       .C6_d       2.9500         H1D       .O1_o       2.77(7)       H9       .C7_d       2.9300         H1D       .O1_n       1.93(6)       H9       .C8_d       3.0700	H1C	.C1_h	2.76(7)	НG	.C5_k	3.0900	
H1C       .01_o       2.77(9)       H8       .H7_m       2.5300         H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1C	.C2_h	2.84(8)	H7	.H8_l	2.5300	
H1C       .02_h       2.27(9)       H9       .H3       2.5200         H1C       .01_h       1.96(7)       H9       .C6_d       2.9500         H1D       .01_o       2.77(7)       H9       .C7_d       2.9300         H1D       .01_n       1.93(6)       H9       .C8_d       3.0700	H1C	.01_0	2.77(9)	H8	.H7_m	2.5300	
H1C         .01_h         1.96(7)         H9         .C6_d         2.9500           H1D         .01_o         2.77(7)         H9         .C7_d         2.9300           H1D         .01_n         1.93(6)         H9         .C8_d         3.0700	H1C	.02_h	2.27(9)	Н9	<b>.</b> H3	2.5200	
H1D .01_0 2.77(7) H9 .C7_d 2.9300 H1D .01_n 1.93(6) H9 .C8_d 3.0700	H1C	.01_h	1.96(7)	Н9	.C6_d	2.9500	
H1D .01_n 1.93(6) H9 .C8_d 3.0700	H1D	.01_0	2.77(7)	Н9	.C7_d	2.9300	
	 H1D	.01_n	1.93(6)	Н9	.C8_d	3.0700	

 Table S8. Contact distances (Angstrom) for AmPhOxam.

N1	H1A	010	0.98(8)	1.87(9)	2.836(7)	172(9)	•
Nl	H1B	02	0.97(6)	2.23(8)	2.908(8)	126(7)	4_555
Nl	H1B	010	0.97(6)	2.08(8)	2.914(7)	143(7)	4_545
Nl	H1C	01	0.98(7)	1.96(7)	2.826(7)	146(6)	1_545
Nl	H1C	02	0.98(7)	2.27(9)	2.877(8)	119(7)	1_545
N1	H1D	01	0.98(4)	1.93(6)	2.832(8)	152(6)	2_646
N3	H3	010	0.980(13)	2.22(8)	2.663(8)	106(5)	•
C5	н5	02	0.9500	2.4900	2.913(9)	107.00	

 Table S9. Hydrogen bonds (Angstrom, Deg) for AmPhOxam.

а	= [	1565.00]	=	[	1_565]	=	x,1+y,z
b	= [	2656.00]	=	[	2_656]	=	1-x,1/2+y,3/2-z
С	= [	3656.00]	=	[	3_656]	=	1-x,-y,1-z
d	= [	4555.00]	=	[	4_555]	=	x,1/2-y,1/2+z
е	= [	1565.00]	=	[	1_565]	=	x,1+y,z
f	= [	4554.00]	=	[	4 554]	=	x,1/2-y,-1/2+z
g	= [	4565.00]	=	[	4_565]	=	x,3/2-y,1/2+z
h	= [	1545.00]	=	[	1_545]	=	x,-1+y,z
i	= [	4544.00]	=	[	4 544]	=	x,-1/2-y,-1/2+z
j	= [	4554.00]	=	[	4_554]	=	x,1/2-y,-1/2+z
k	= [	4564.00]	=	[	4 564]	=	x,3/2-y,-1/2+z
1	= [	2555.00]	=	[	2_555]	=	-x,1/2+y,1/2-z
m	= [	2545.00]	=	[	2_545]	=	-x,-1/2+y,1/2-z
n	= [	2646.00]	=	[	2_646]	=	1-x,-1/2+y,3/2-z
0	= [	3656.00]	=	[	3_656]	=	1-x,-y,1-z
р	= [	4545.00]	=	[	4_545]	=	x,-1/2-y,1/2+z

**Table S10**. Translation of symmetry code to equiv. pos for AmPhOxam.

**Table S11.** Colorimetric measurements (average values of lightness  $L^*$ , chromaticity coordinates  $a^*$  and  $b^*$ , and color difference  $\Delta E$ ) determined for Carrara marble and biomicritic limestone before and after treatment with AmPhOxam.

		White Carrara marble			
	L*	a*	b*	ΔE	
Untreated	85.52(±0.62)	1.38(±0.19)	15.26(±0.56)	2 7(2/10 42)	
AmPhOxam 2.50% w/w	82.12(±0.39)	2.13(±0.13)	16.65(±0.68)	5.705(±0.42)	
		Biomicritic limestone			
Untreated	89.37(±1.04)	-0.07(±0.12)	4.33(±0.80)	2 70/+0 40)	
AmPhOxam 2.50% w/w	91.65(±1.05)	-0.50(±0.22)	4.37(±1.56)	2.79(±0.49)	



**Figure S1.** Relaxed PES diagrams reporting the relative energy variations calculated on rotating the –COO<sup>-</sup> (blue) and the phenyl ring (red) of the *N*-phenyloxamate anion.



**Figure S2**. Thin sections photomicrographs of untreated Carrara marble (top) and biomicritic limestone (bottom) samples. Carrara marble (TPPL mode) shows a typical homeoblastic polygonal microstructure. The biomicritic limestone (bottom) reveals (CTPL mode) an abundant microfossilifer *fauna* embedded within a micritic matrix; the carbonatic cement is very scarce.







**Figure S3.** SEM images of Carrara marble. Untreated sample (top); overview of treated sample (middle); close-up of previous image showing the mineral coating (bottom).



**Figure S4.** Superimposed FT-NIR spectra of CaPhOxam and treated samples of Carrara marble and biomicritic limestone.