

## Formation of jellyfish-like $\text{Ag}(0)_x\text{-Mn}_3\text{O}_4$ microglobules at the surface of $\text{Ag}(\text{I})$ and $\text{Mn}(\text{II})$ nitrate solution with $\text{NH}_3$ vapor

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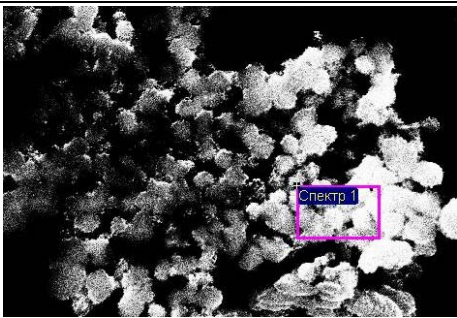
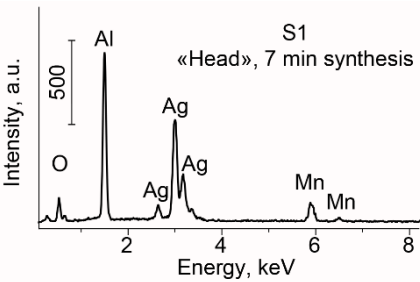
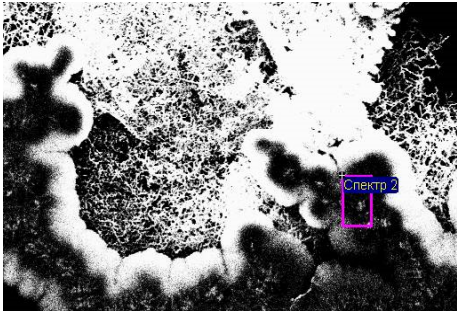
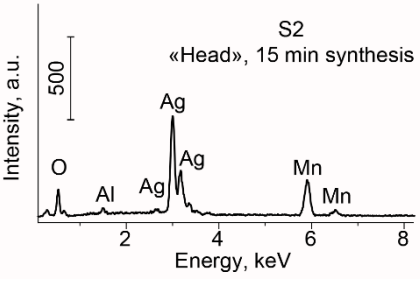

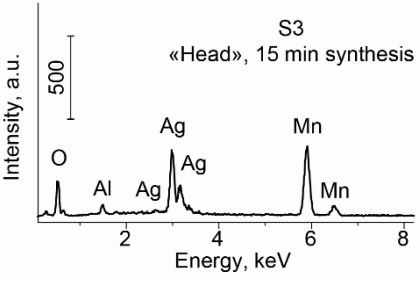
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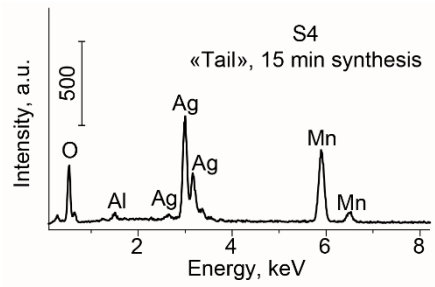
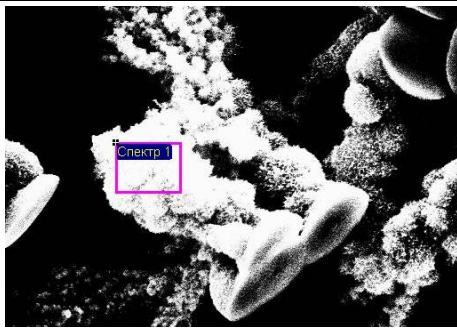
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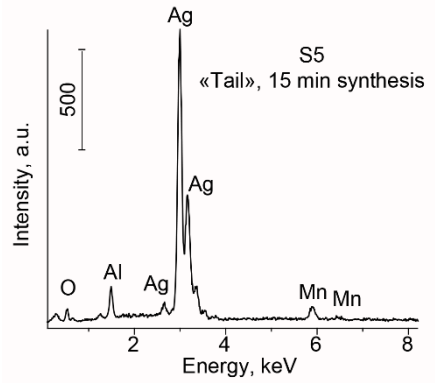
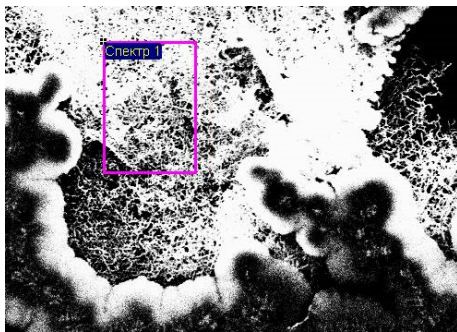
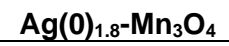
Analysis of the structure compositions given in SI suggests that at the treatment beginning, the topping structure “head” is formed with the higher silver content (S1 EDX spectrum of the sample obtained during 7 minutes of treatment). With increasing reaction duration, the Ag/Mn ratio decreases (S2) and almost equalizes at the periphery of the topping (S3). As for the lower part, the “tail” of the formed structures, the Ag/Mn ratio is slightly higher (S4) than in the upper part (S3), which is consistent with the model of growth propagation from the surface to the depth of the solution. Moreover, the Ag/Mn ratio becomes high in the lower, growing part of the “jellyfish tentacles” (S5-S6). It can be seen from the images and spectra (S6-S7) that some parts of the 1D structures remain almost uncovered by manganese oxide.

**Table S1.** SEM images, EDX spectra and compositions of  $\text{Ag}(0)_x\text{-Mn}_3\text{O}_4$  structures

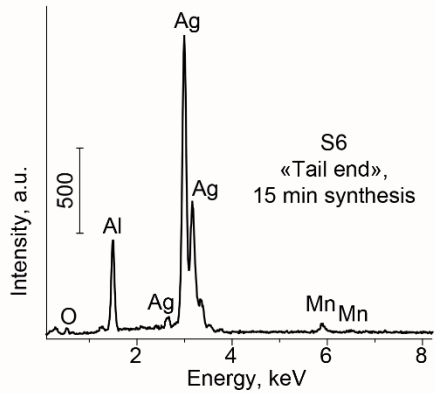
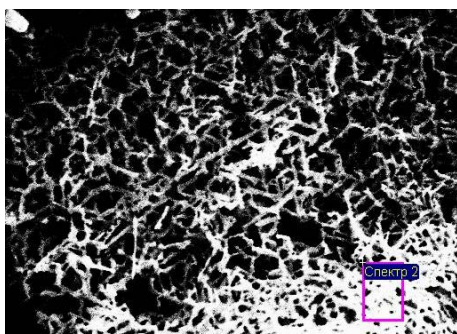
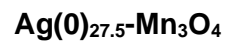
Image	Spectrum	Composition	
		Element	Weight % Atomic %
		C K	3.54   9.79
		O K	20.30   42.20
		Al K	23.61   29.10
		Mn K	9.10   5.51
		Ag L	43.45   13.40
<b><math>\text{Ag}(0)_{7.3}\text{-Mn}_3\text{O}_4</math></b>			
		C K	2.09   6.22
		O K	28.11   62.89
		Al K	1.00   1.33
		Mn K	21.03   13.70
		Ag L	47.78   15.86
<b><math>\text{Ag}(0)_{3.5}\text{-Mn}_3\text{O}_4</math></b>			
		C K	2.56   7.13
		O K	27.68   57.93
		Al K	1.77   2.20
		Mn K	38.87   23.69
		Ag L	29.13   9.04
<b><math>\text{Ag}(0)_{1.3}\text{-Mn}_3\text{O}_4</math></b>			



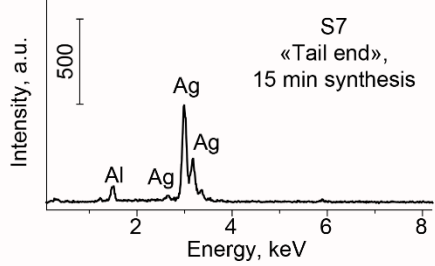
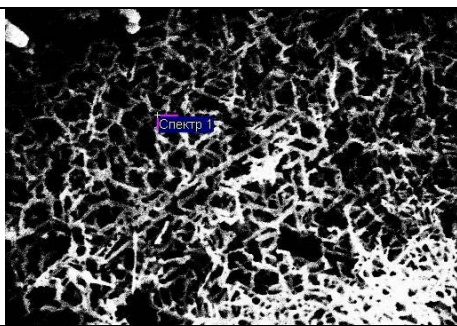
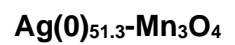
C K	2.19	5.82
O K	33.03	65.96
Al K	0.84	0.99
Mn K	29.05	16.89
Ag L	34.89	10.33



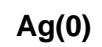
O K	12.07	44.19
Al K	3.54	7.67
Mn K	4.43	4.73
Ag L	79.96	43.41

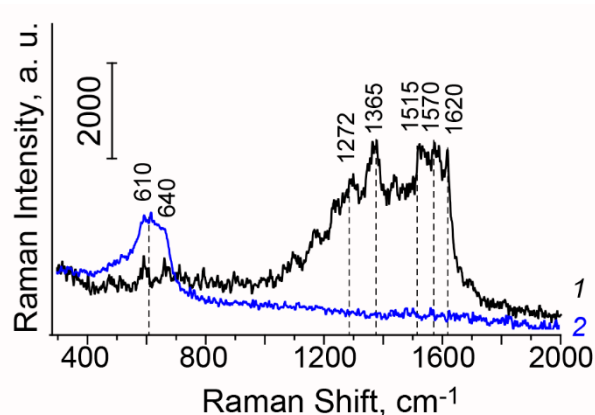


O K	6.01	24.21
Al K	10.21	24.37
Mn K	2.42	2.84
Ag L	81.36	48.58



Al K	6.01	20.35
Ag L	93.99	79.65





**Figure S1.** Raman spectra of R6G ( $C = 10^{-7}$  mol/l, black curve 1), and R6G ( $C = 10^{-9}$  mol/l, blue curve 2) deposited on Al foil with a layer of  $\text{Ag}(0)_x\text{-Mn}_3\text{O}_4$  nanocomposite.

**Table S2.** Assignment for Raman Spectra of R6G molecule

Raman shift, $\text{cm}^{-1}$	Vibration mode	
	[1]	[2]
610-613	ip XRD; op XRD	C-C-C ring in-plane vibration
770-775	op C-H bend; ip XRD	op C-H bend
1125		in C-H bend
1180-1184	ip XRD; ip C-H bend; ip N-H bend	in C-H bend
1310-1312	ip XRB N-H bend; $\text{CH}_2$ wag	in N-H bend
1360-1364-	XRS; ip C-H bend	C-C str.
1510	XRS; C-N str; C-H bend; N-H bend	C-C str.
1575-1577	XRS; ip N-H bend	in N-H bend
1651	XRS; ip C-H bend	C-C str.
ip: in plane. op: out of plane. XRD: xanthene ring deformations. XRB: xanthene ring breath. XRS: xanthene ring stretch. str: stretch		

[1] L. Jensen and G. C. Schatz, J. Phys. Chem. A, 2006, 110, 5973-5977.

[2] C. Wu, E. Chen and J. Wei, Colloids Surf. A, 2016, 506, 450-456.