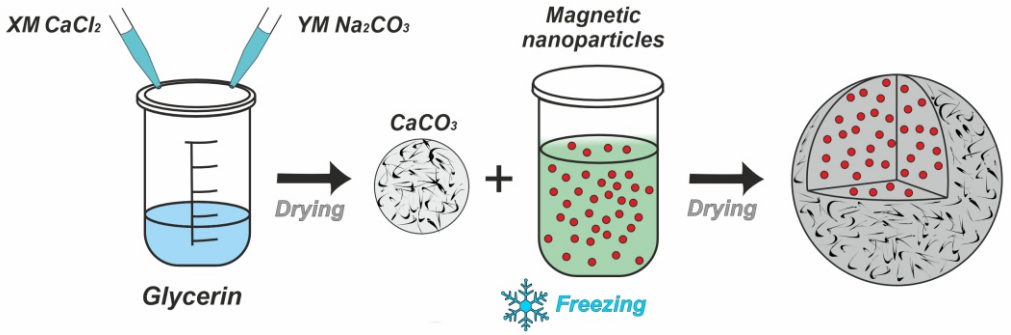
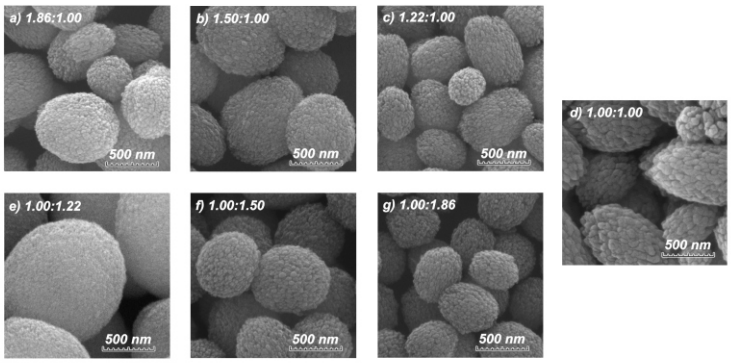
CaCO3: various shapes, sizes and magnetic phases as a result of synthesis and recrystallization

Calcium carbonate particles, as a means of targeted delivery, are biocompatible and biodegradable; unlike liposomes, they have a high buffer capacity. Allotropic modification, size, and shape of particles affect their properties, loading capacity, and, therefore, their scope of application. In this work, we synthesized submicron CaCO3 particles of various shapes using the coprecipitation of solutions of CaCl2 and Na2CO3 in various concentration ratios, and took and processed SEM images of the resulting samples. Analysis of the obtained graphs showed that when the ratio of the concentrations of Ca2+ and CO32- salts is 1.00:1.00, the graph has a pronounced peak at 500 nm (longitudinal particle size), the number of particles with this size is the maximum of all the samples examined; demonstrates low polydispersity. The average particle sizes are the smallest of those considered (about 500 nm), and the highest ellipticity is demonstrated (the ratio of longitudinal to transverse dimensions is 1.54). Also, using XRD analysis, the obtained calcium carbonate particles with pre-prepared magnetic nanoparticles frozen into them were examined for the type of modification, size, presence of a magnetic phase, as well as recrystallization. The results of the analysis showed the promising possibility of further use of the obtained particles as stable drug carrier capsules.

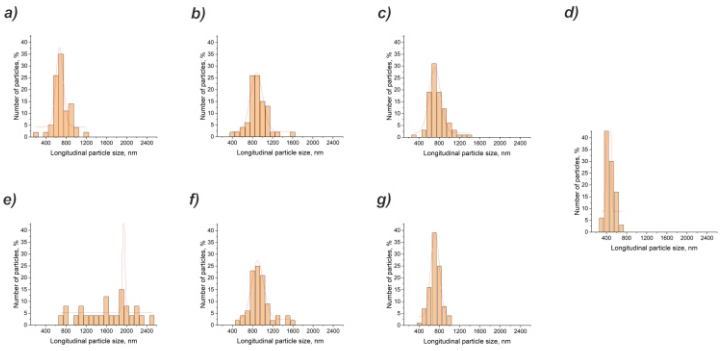
X	Y
0.65	0.35
0.60	0.40
0.55	0.45
0.50	0.50
0.45	0.55
0.40	0.60
0.35	0.65



I



II



III

	a) 1.86:1.00	b) 1.50:1.00	c) 1.22:1.00	d) 1.00:1.00	e) 1.00:1.22	f) 1.00:1.50	g) 1.00:1.86
Number of round particles, %	3.50	22.00	5.97	0.00	30.76	28.30	14.50
Number of elliptical particles, %	96.50	78.00	94.03	100.00	69.24	71.70	85.50
$\bar{b} \pm \bar{x}$	762.03±117.33	953.84±137.76	816.65±88.65	516.80±46.68	889.47±224.835	994.47±101.94	765.89±57.29
$\bar{a} \pm \bar{y}$	600.47±98.83	789.34±121.17	613.38±57.17	336.13±34.73	962.67±208.00	886.09±81.84	663.28±53.85
$\frac{\bar{b}}{\bar{a}} \pm \frac{\bar{x}}{\bar{y}}$	1.27±1.19	1.21±1.14	1.33±1.55	1.54±1.34	0.92±1.08	1.12±1.25	1.15±1.06

XRD