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Novel synthesis of magnetic poly (cyclotriphosphazene-co-4, 4′ -sulfonyldiphenol) nanotubes with magnetic phase embedded in walls

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Table S1. The details of the products with different reaction ratios

m_{Fe3O4} /g	m_{HCCP} /g	m_{BPS} /g	V_{TEA} /mL	V_{THF} /mL	C_{Fe3O4} /mg·mL^{-1}	C_{HCCP} /mg·mL^{-1}	Ratio Fe_3O_4/HCCP	Morphology
0.025	0.125	0.27	1.25	100	0.25	1.25	0.2	Fig.S1 (a) and (b)
0.025	0.25	0.54	2.5	100	0.25	2.5	0.1	Fig.S1 (c) and (d)
0.025	0.5	1.08	5	100	0.25	5	0.05	Fig.S1 (e) and (f)
0.05	0.5	1.08	5	100	0.5	5	0.1	Fig.S1 (g) and (h)
0.1	0.5	1.08	5	100	1	5	0.2	Fig.S1 (i) and (j)
0.2	0.5	1.08	5	100	2	5	0.4	Fig.S1 (k) and (l)

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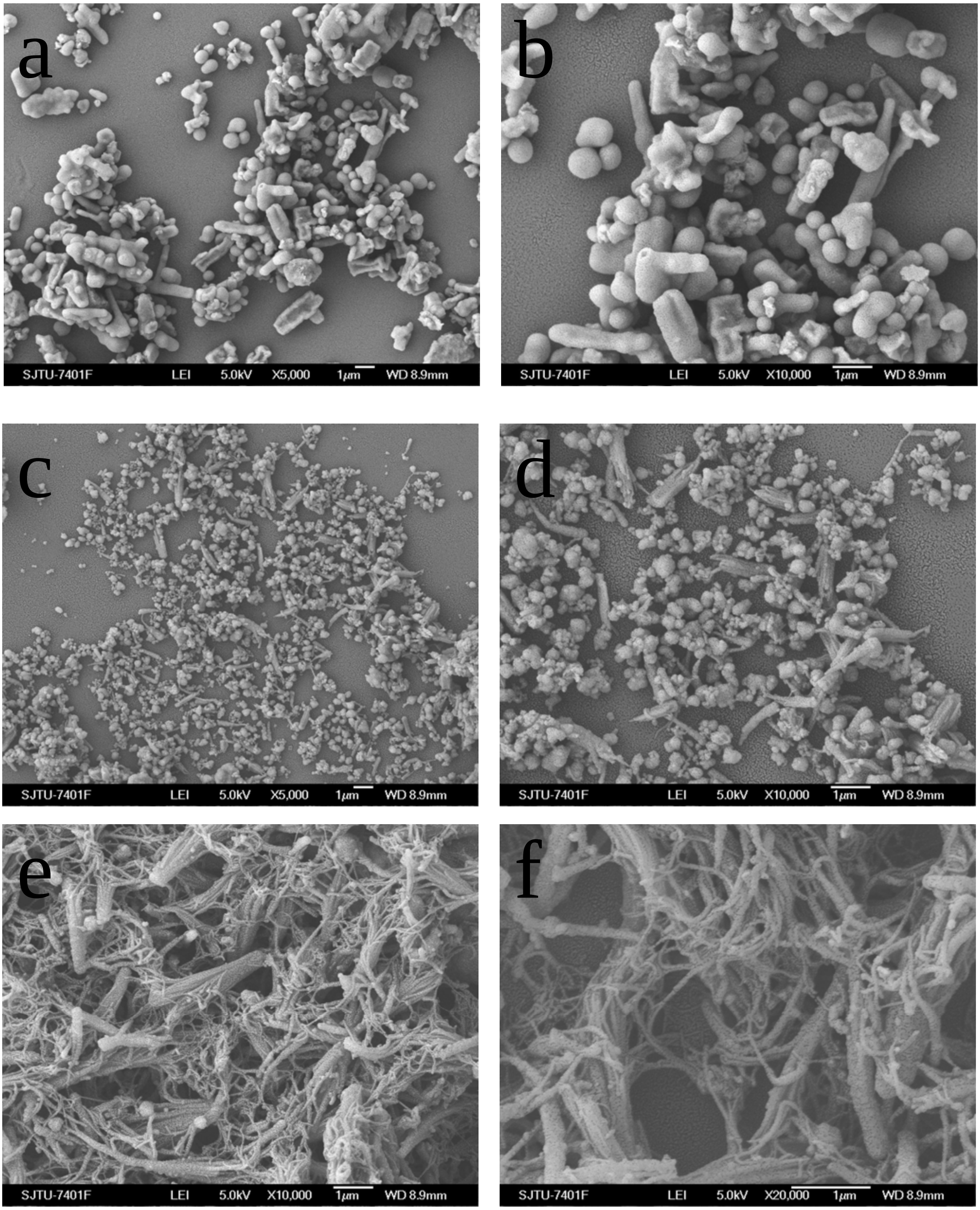

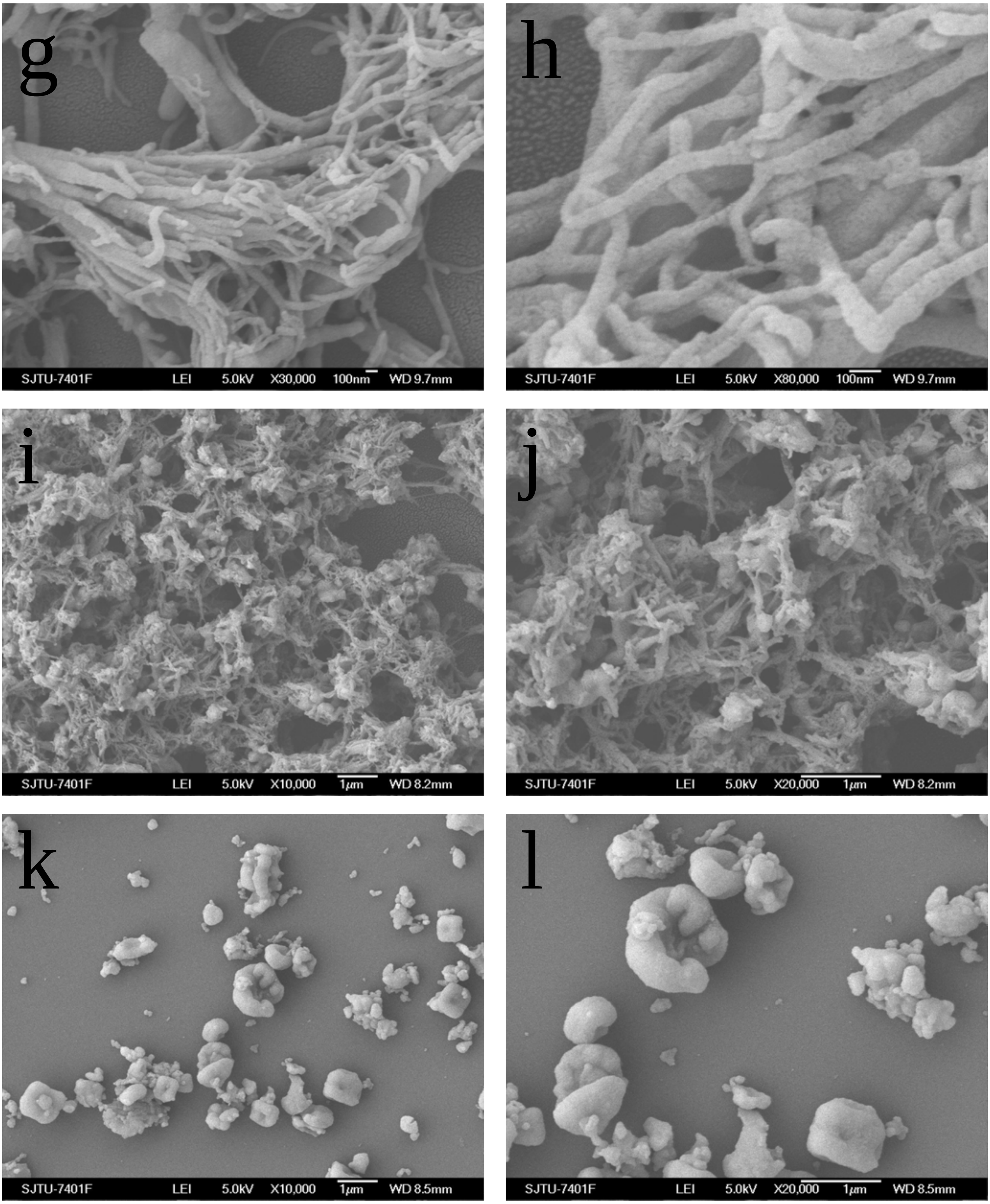

Figure S1 SEM of the products with different reaction ratios

The morphology of the magnetic PZS nanotubes is highly influenced by the content of Fe_3O_4 nanoparticles. Table S1 shows the details of the products with different reaction ratios. Figure S1 shows the SEM images of the products with different reaction ratios corresponding to Table S1.

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Accordingly, within appropriate concentration limits, when the concentration of Fe_3O_4 is fixed, the more HCCP is used, the more successful the synthesis of magnetic PZS nanotubes is; while when the concentration of HCCP is fixed, the less Fe_3O_4 is used, the more successful the synthesis is. It is well known that the growth of crystal is affected by the presence of impurities. When there is no Fe_3O_4 and HCCP is within appropriate concentration limits, TEACl nanocrystal can grow along their axes to form nanometer-sized rodlike structure. When a small quantity of Fe_3O_4 is added, the growth of TEACl nanocrystal is slightly influenced. When HCCP is at a relatively low concentration, few primary template nanocrystals (TEACl) are produced by the reaction and no enough templates are provided in short time. At this time, some primary polymer particles adhered onto the surface of the magnetite nanoparticles can not adhere onto the templates, but grow themselves to form magnetic microspheres; as reaction proceeds, more templates being produced, some primary polymer particles adhered onto the surface of the magnetite nanoparticles adhere onto the templates to form magnetic nanotubes (see Fig. S1 (a, b, c, d)). When HCCP is at a relatively high concentration, abundant primary templates are produced and all the primary polymer particles adhered onto the surface of the magnetite nanoparticles tend to adhere onto the templates to form magnetic nanotubes (see Fig. S1 (e, f, g, h)). When large quantity of Fe_3O_4 is added, the growth of TEACl nanocrystal is highly influenced by Fe_3O_4. They tend to grow fast and form irregular morphology, inducing the primary polymer particles adhered onto the surface of the magnetite nanoparticles adhere onto the templates to form irregular structures (see Fig. S1 (i, j, k, l)).