Electronic Supplementary Material (ESI) for Dalton Transactions.

The structural and magnetic properties of $BaFe_{12}O_{19}$ nanoparticles: Effect of residual sodium ions

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1. **Chemical composition of the synthesized BaFe12O19 nanoparticles using NaOH as a pH modifier to precipitate hydroxides. Here, composition of nanoparticles was characterized with Energy dispersive spectroscopy (EDS) for powdered samples.**

Table S1. Chemical composition of the nanoparticles prepared with NaOH and without NaOH. The chemical composition is denoted with molar ratio normalized with molar amount of Ba.

Sample	Fe	Ba	**Na**	Cl	Si	Cu	Zn
800C 1h (NaOH)	11.4	1	**2.2**	0.9	0.1	-	-
900C 8h (NaOH)	11.9	1	**1.9**	1.6	0.1	-	-
900C 8h (NH_4OH)	13.4	1	**-**	0.05	-	-	-
BaM-C	9.4	1	**-**	-	-	0.3	0.2

2. X-ray photoelectron spectrum and low temperature Raman spectrum of Na-free BaM nanoparticles prepared with NH_4OH as a pH modifier.

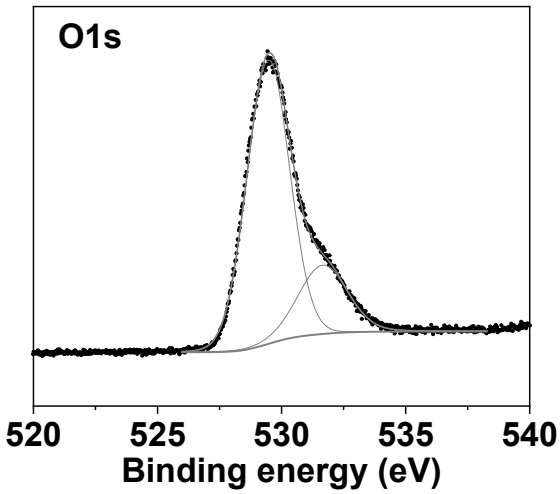

Fig. S1. X-ray photoelectron spectroscopy of Na-free BaM nanoparticles after annealing at 900°C for 8 hours.

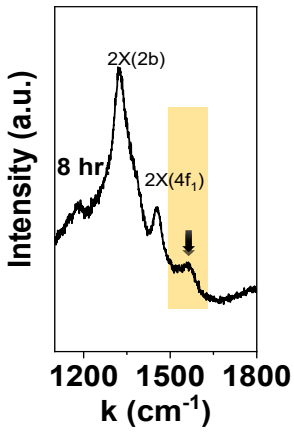

Fig. S2. Low temperature Raman spectrum of Na-free BaM nanoparticles after annealing at 900°C for 8 hours. Magnon scattering is detected even after extended annealing.

3. Thermomagnetic measurement

Thermomagnetic measurement of Curie temperature (Tc) was carried out with thermal balance having magnets (Discovery TG55, TA instruments). The measured Tc was ca. 455oC irrespective of annealing time. Sharpness of Hopkinson peak is enhanced for BaM nanoparticles after prolonged annealing, which implies enhanced magnetic homogeneity [Pfeiffer, H.; Schuppel, W. Temperature dependence of the magnetization in fine particle systems and the Hopkinson effect. Application to barium ferrite powders. J. Mag. Mag. Mater. **1994**, 130, 92-98.].

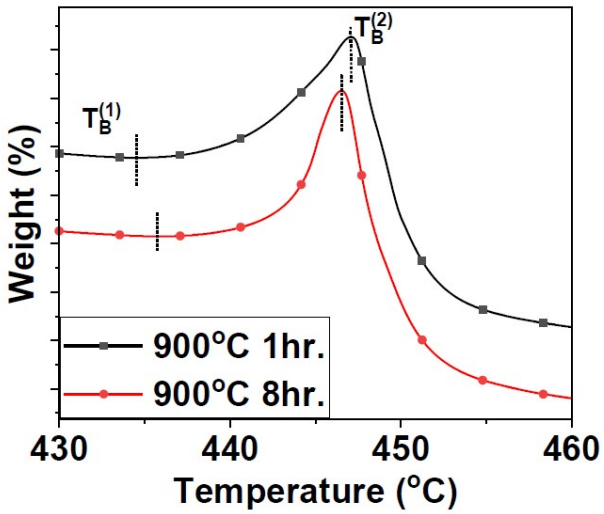

Figure S3. Thermomagnetic measurement of BaM nanoparticles showing Hopkinson peaks.