Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.
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Supporting documents

Bone cement based nanohybrid as super biomaterial for bone healing

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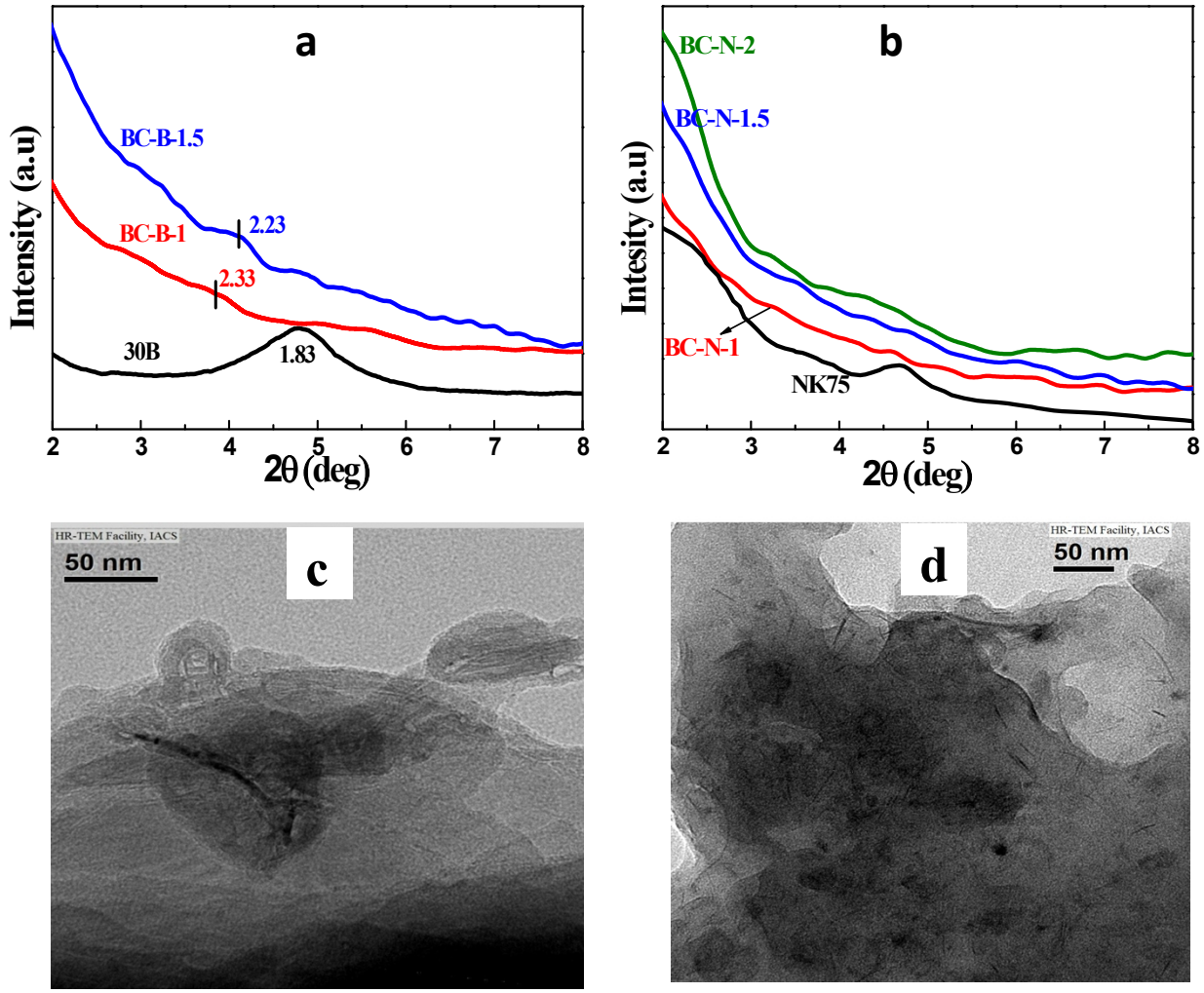

Figure S1: Low angle XRD plots revealing the nanostructures of (a) 30B nanoclay and its intercalated nanohybrids with bone cement, (b) NK 75 nanoclay and its exfoliated nanohybrids with bone cement and (c&d) High resolution TEM images of 1wt% of 30B and NK 75 nanofillars reinforced bone cement nanohybrids, respectively. Both XRD and TEM studies indicate intercalated pattern of BC-B while BC-N nanohybrid exhibit exfoliated structure.

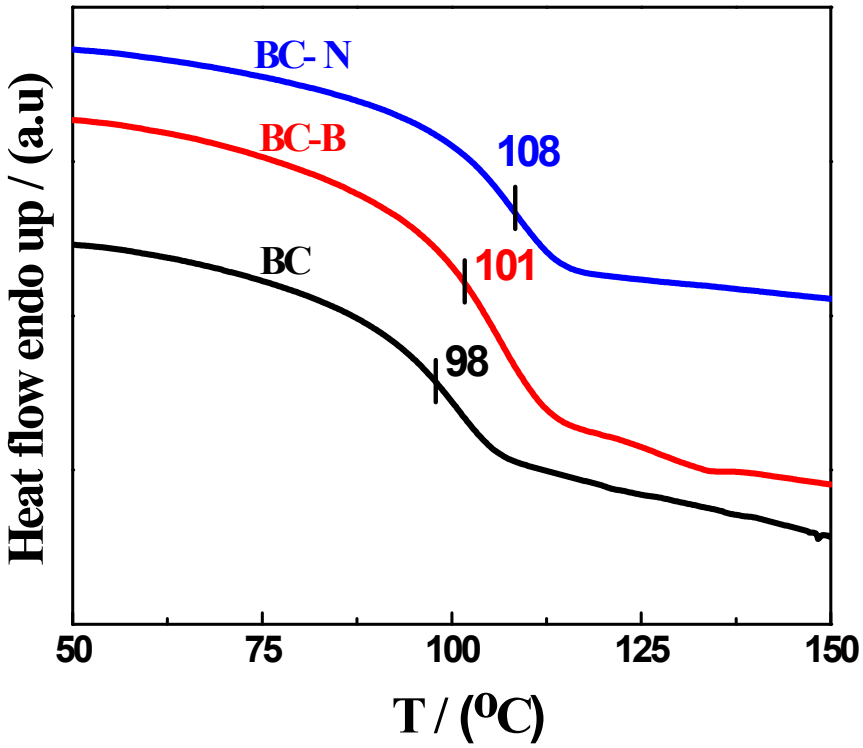

Figure S2: DSC thermogrammes of pure bone cement (BC) and its two indicated nanohybrids (BC-B and BC-N) and vertical lines represent the T_g values of the indicated specimens. Scanning rate was kept at 10°/min for all the specimens. The glass transition temperature show the increasing trends for nanohybrids and amongst the nanohybrids BC-N exhibit highest glass transition temperature owing to the better interaction between polymer and organophilic nanoparticles.

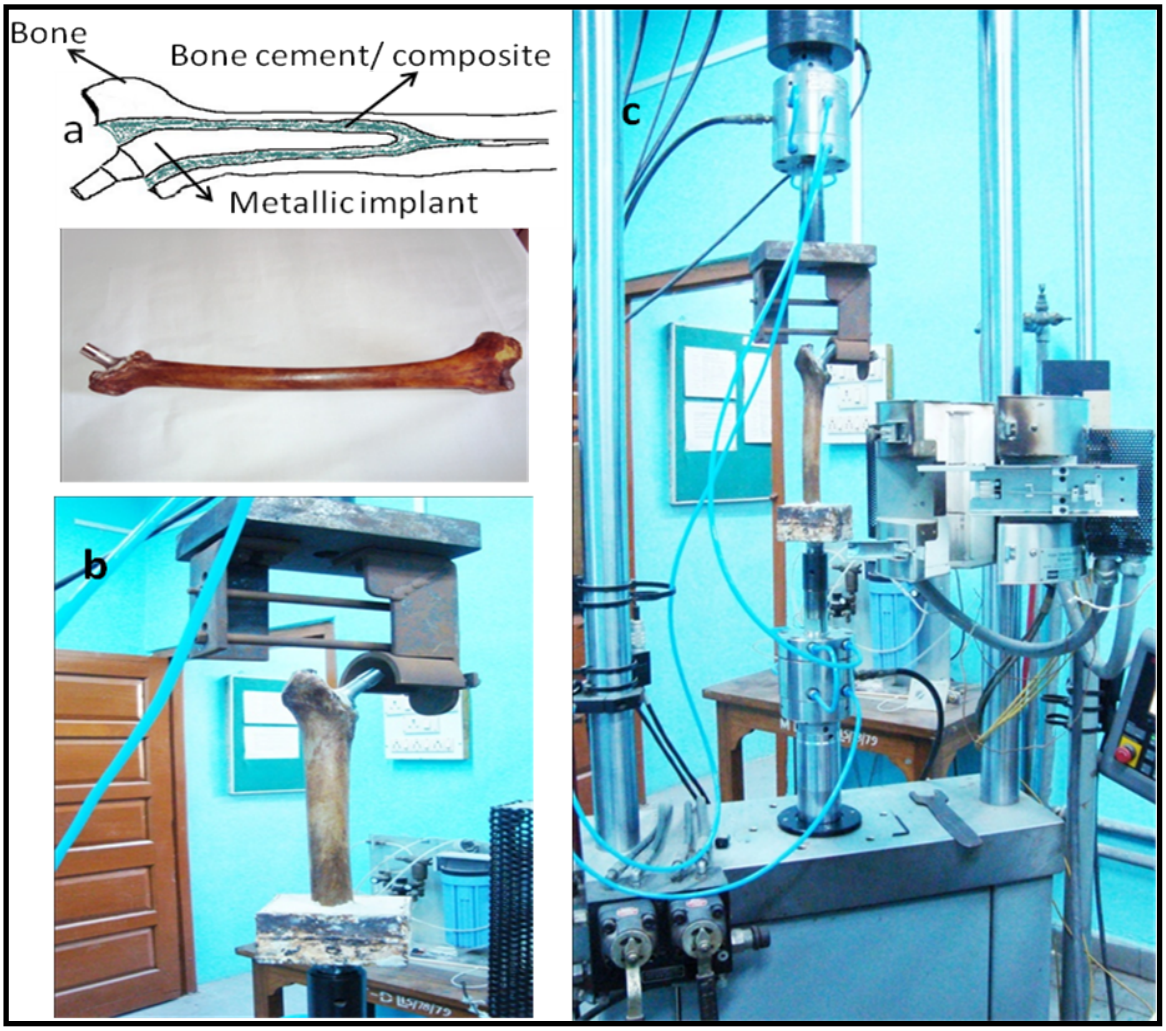

Figure S3: Experimental setup for fatigue testing (a) metallic cemented stem implanted human femur bone and its schematic diagram, (b) human hip joint (ilium) like setup (c) total experimental setup with MTS machine.

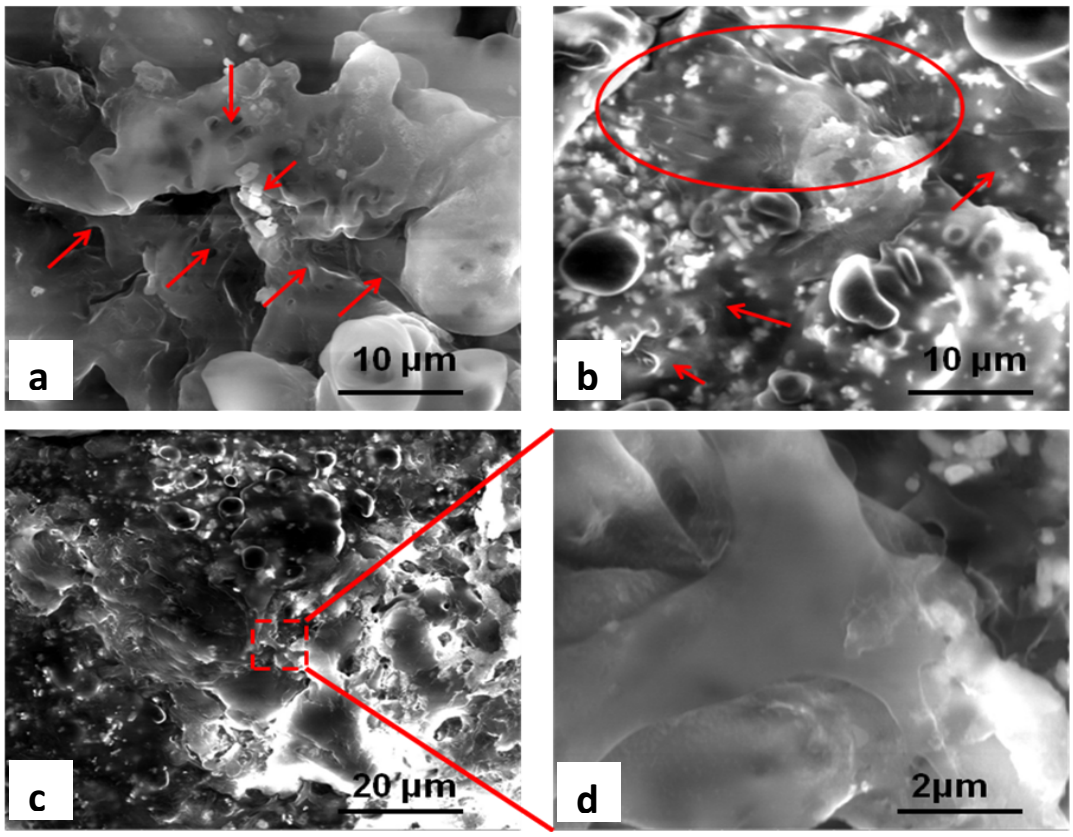

Figure S4: Surface morphology through SEM after the cell attachment on bone cement and its nanohybrids specimens for one day of incubation, (a) in pure bone cement, maximum cell are found to be detached from the surface, (b) some number of cells are spread (shown by the arrow and circle) and some are detached from the surface (rounded) of BC-B, and, (c) BC-N; it is clearly visible that the cells have been fully spread tightly holding the surface of the BC-N nanohybrid, and, (d) high resolution of the same image showing the cells grown on top of BC-N nanohybrid tightly.

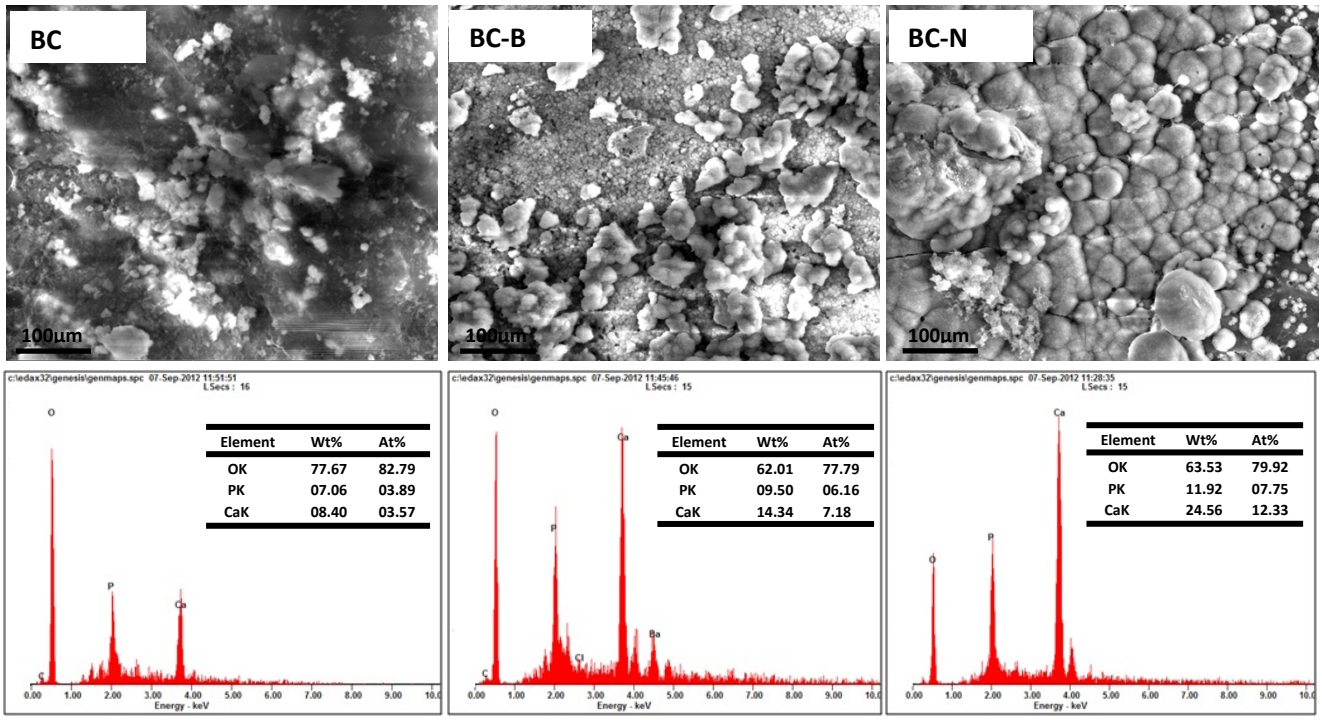

Figure S5: Hydroxy Apatite (HAP) formation on BC, BC-B and BC-N after 15 days of SBF immersion. SEM and EDAX spectra show higher deposition of HAP is in the order of BC-N> BC-B> BC. Inserted tables represent the Ca and P percentages as analyzed from the EDAX patterns showing greater percentage of Ca and P on BC-N nanohybrid as compared to BC-B nanohybrid.

Table shows the deposition of calcium (Ca) and phosphorous (P) content in BC, BC-B and BC-N surface for 15 days SBF immersion.

Element	BC	BC-B	BC-N
P	7.06	9.5	11.92
Ca	8.4	14.34	24.56

Table S1 shows the Mg and Fe contents in 30B and NK-75 nanoclays, calculated from Fig. 1.

	Mg %	Fe %
30B	2.5	2
NK75	0.9	8

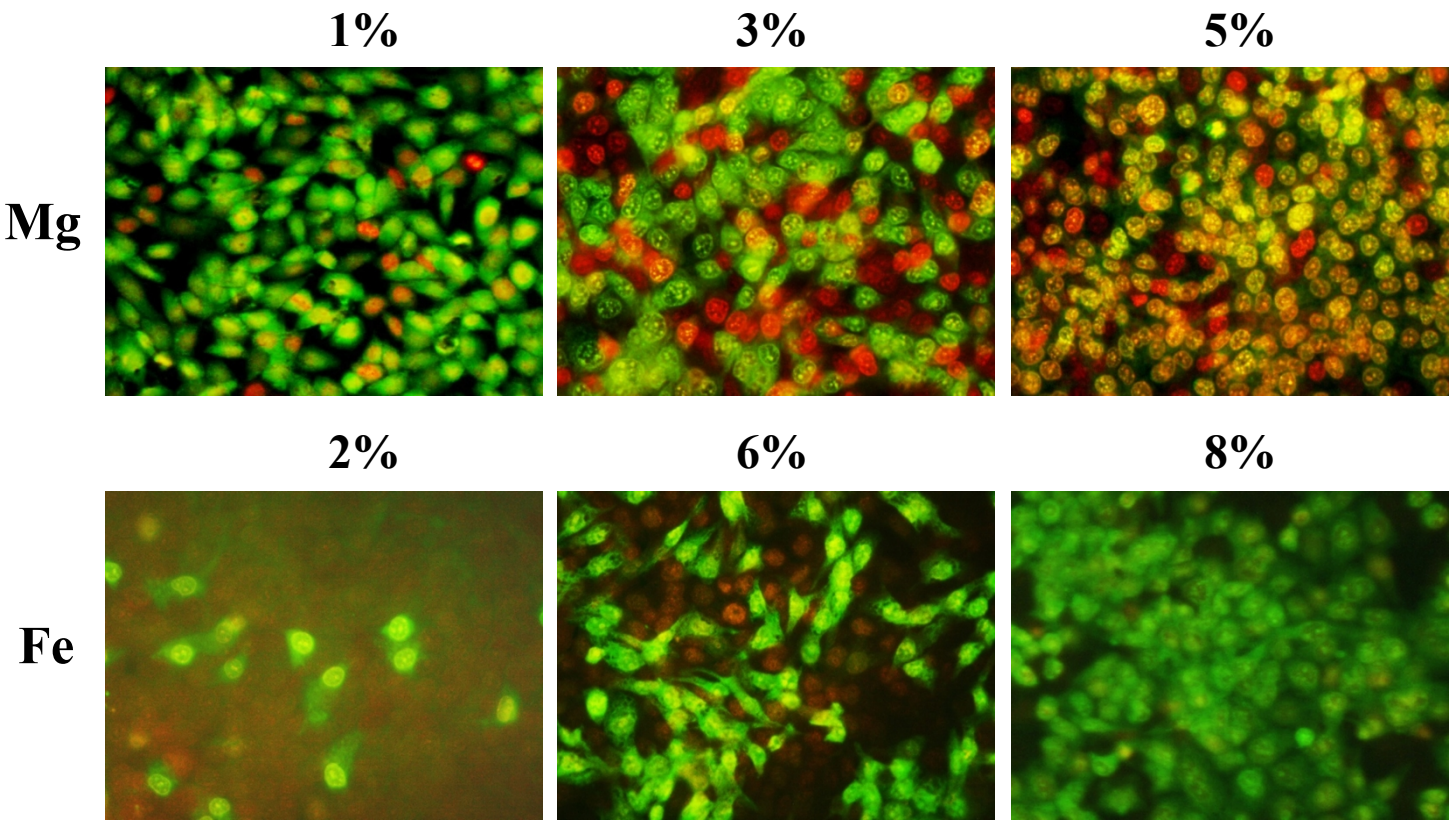

Figure S6: Cell viability in different concentrations of Fe (2, 6 and 8%) and Mg (1, 3 and 5%) ion containing systems were analyzed through apoptosis study in which green color represents live cells and red color represent dead cells. From these images, it is clear that at low concentrations of Mg (1 wt.%) shows high number of live cells but live cell density has reduced

with increasing concentration of Mg. In case of iron (Fe), live cell density has enhanced with increasing its concentration up to 8%. The percentage of Fe or Mg was chosen to mimic the concentration of respective ions in the composition of nanoclays (30B and NK-75).