Supporting Information for:

Bismuth Chalcogenides: Multifunctional Enhancement of Radiopacity, Mechanical Resilience, and Osteogenesis in PMMA Bone Cements for Vertebroplasty

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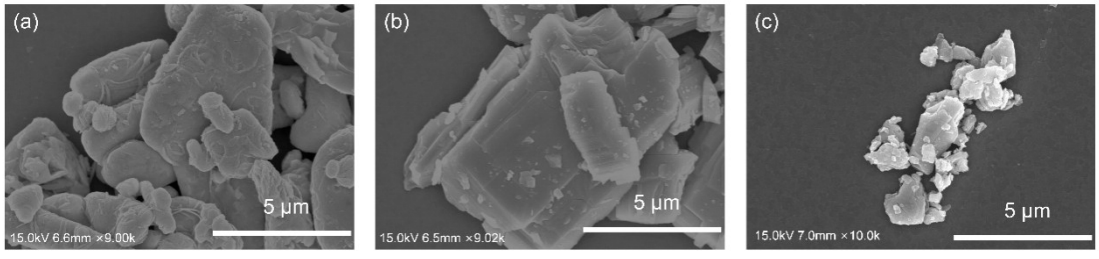

Figure S1. SEM images of purchased Bi_2X_3 particles: (a) Bi_2O_3, (b) Bi_2S_3, (c) Bi_2Se_3.

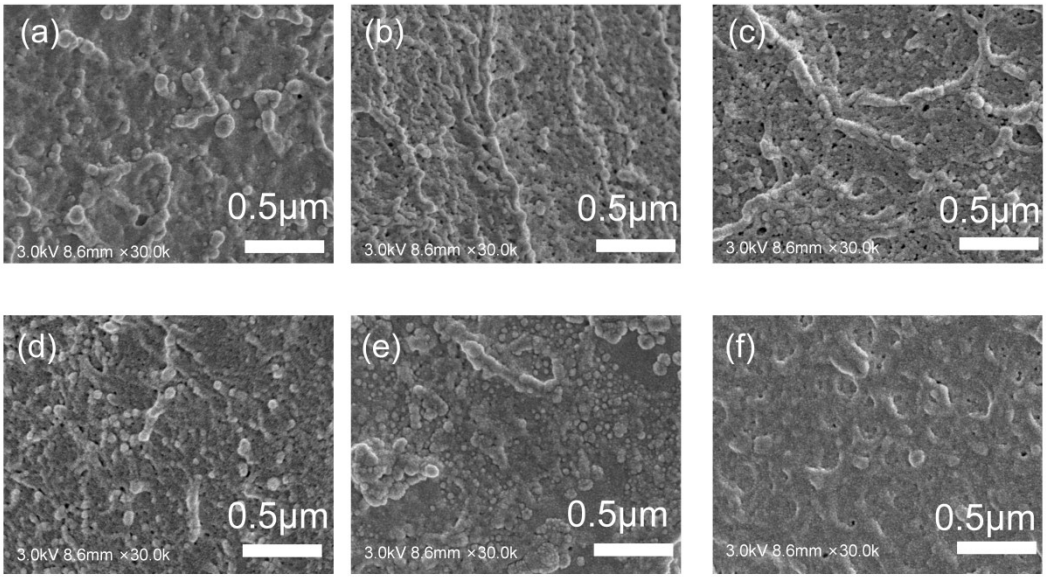

Figure S2. SEM images of Bi_2O_3-PMMA bone cement with various Bi_2O_3 content of: (a) 0%, (b) 2.5%, (c) 5%, (d) 7.5%, (e) 20%, (f) 30%. The sample with 0% Bi_2O_3 refers to the pure PMMA bone cement without Bi_2O_3. The SEM image of the sample with 10% Bi_2O_3 is shown in Figure 1 in the main text.

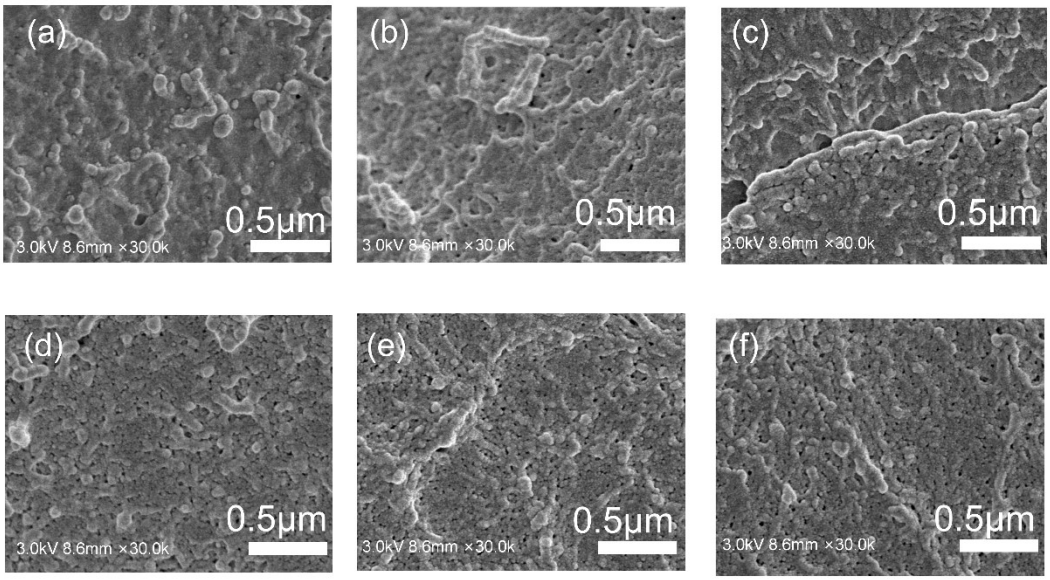

Figure S3. SEM images of Bi_2S_3-PMMA bone cement with various Bi_2S_3 content of: (a) 0%, (b) 2.5%, (c) 5%, (d) 7.5%, (e) 20%, (f) 30%. The sample with 0% Bi_2S_3 refers to the pure PMMA bone cement without Bi_2S_3. The SEM image of the sample with 10% Bi_2S_3 is shown in Figure 1 in the main text.

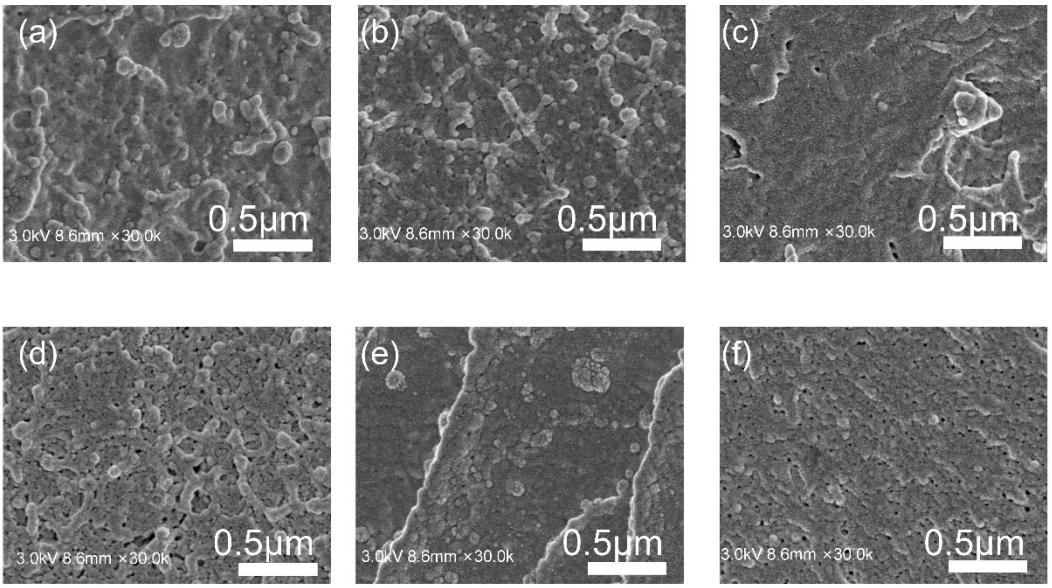

Figure S4. SEM images of Bi_2Se_3-PMMA bone cement with various Bi_2Se_3 content of: (a) 0%, (b) 2.5%, (c) 5%, (d) 7.5%, (e) 20%, (f) 30%. The sample with 0% Bi_2Se_3 refers to the pure PMMA bone cement without Bi_2Se_3. The SEM image of the sample with 10% Bi_2Se_3 is shown in Figure 1 in the main text.

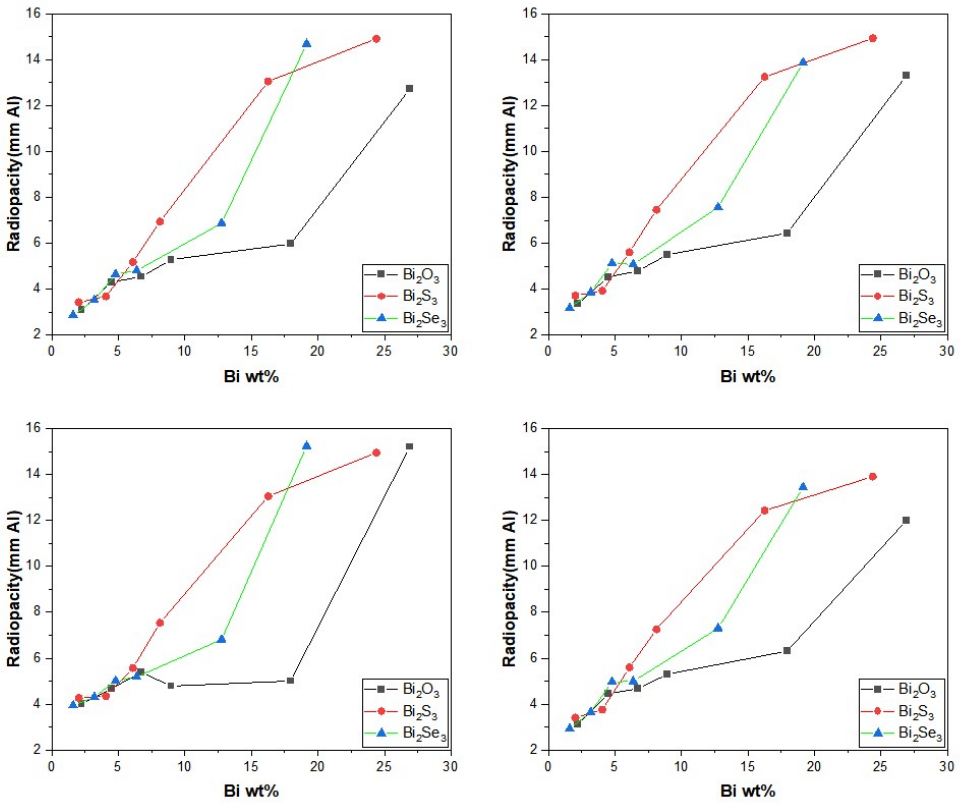

Figure S5. Radiopacity of Bi_2X_3-PMMA bone cements with varying Bi contents at different tube voltages: (a) 80.9 kV, (b) 80.9 kV, (c) 101.9 kV, (d) 120.9 kV. Radiopacity values were determined from Figure 5. The Bi element content is calculated from its Bi_2X_3 weigh ratio in each Bi_2X_3-PMMA sample.

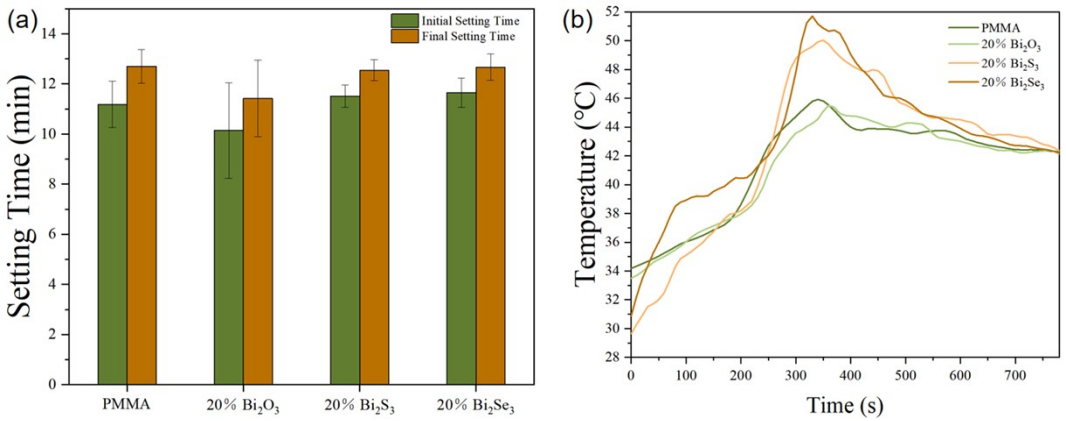

Figure S6. Curing properties of commercial PMMA and 20% Bi_2X_3 (X=O, S, Se)-PMMA bone cements. (a) Initial and final setting times; (b) Curing temperature changes at 37℃ constant temperature. Error bars represent standard deviations (n=3).