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An Approach towards High Quality Bulk Zeolitic Imidazolate Framework Glasses

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Melt-Quenched Zeolitic Imidazolate Framework (MQ-ZIF) glasses have attracted much attention due to their unique, hybrid structure. Recently several breakthroughs have been reported regarding their unique structure and properties. However, production of bulk, homogenous, bubble-free samples of MQ-ZIF glasses is still challenging, due to facile degradation at their liquid state. In this contribution, we report on the impact of the production method on the quality (including bubble content, homogeneity, optical transparency) of the ZIF glasses by taking ZIF-62 (ZnIm_{1.75}bIm_{0.25}) glass as an example. We first produce ZIF-62 (ZnIm_{1.75}bIm_{0.25}) glasses with the size of about $\phi 10 \times 2$ mm by using three different methods (melting under protective gas, hot-pressing-melting in vacuum, and spark plasma sintering). Then we evaluate which method is the most suitable for producing high quality ZIF-62 glass. This glass should be used for property characterizations (particularly for optical properties), up-scale production and functionality studies. Finally, the quality evaluation results show that the spark plasma sintering is a promising technique for fabricating the high quality ZIF glasses in a large scale.