Investigating catalytic effects of a zeolitic imidazolate framework, ZIF-8, on the phase transition and thermal decomposition of ammonium nitrate

R. Kazemshoar-Duzduzani*, A. Mousaviazar, K. Ghani, M. Jafari

Faculty of Applied sciences, Malek- Ashtar University of Technology, Shahin Shahr

* *E-mail: reza.kazemshoar23@gmail.com*

composite solid propellants, widely used in space and military missions [1]. consist of two major components, i.e., a gas-producing solid oxidizer and an organic, metal fuel and Perchlorates [2]. AN, which has extensive applications in the area of nitrogen fertilizers and explosives, is of interest as a potential replacement for AP, due to its environmentally innocuous products, and positive oxygen balance (+20%) [3]. The advantages of AN-based propellants can be expressed as their low cost, smooth burning without smoke, and production of a high volume of gases [4]. Using the AN in large missile motors, despite these privileges, is restricted due to some disadvantages such as the room temperature volume changing phase transformations, adsorption of moisture, low energy, and low burning rate [5]. In this work, the phase transitions and the thermal decomposition of AN were investigated under the influence of a zeolitic imidazolate framework (ZIF-8). Different percentages of AN/ZIF-8, i.e., 0.95:0.05, 0.9:0.1, and 0.85:0.15, were prepared by the solvent methods, and their phase transition and thermal decomposition have been studied by TG-DSC. To investigate the interactions between AN and ZIF-8, the UV–Vis-DRS and XRD techniques were used.

Keywords: Ammonium nitrate, Phase transition, Thermal decomposition, Zeolitic imidazolate frameworks, ZIF-8.

References

[1] S. Chaturvedi, and P. N. Dave. Arab. J. Chem. **2019**, 12(8), 2061-2068.
[2] S. Chaturvedi, and P. N. Dave. J. Energ. Mater. **2013**, 31(1), 1-26.
[3] K. Kajiyama, Y.-i. Izato, and A. Miyake. J. Therm. Anal. Calorim. **2013**, 113, 1475-1480.
[4] T. Lee, J. W. Chen, H. L. Lee, T. Y. Lin, Y. C. Tsai, S.-L. Cheng,. S.-W. Lee, J.-C. Hu, and L.-T. Chen. Chem. Eng. J. **2013**, 225, 809-817.
[5] N. Golovina, G. Nechiporenko, G. Nemtsev, G. Dolganova, V. Roshchupkin, D. Lempert, G. Manelis. Russ. J. Appl. Chem. **2007**, 80, 24-30.