

Analysis of differences in crystal movements from gas releasing crystals as dictated by lattice energy interactions

Dylan J. Shields^a, Karthik Sambath^a, Durga Karothu^b, Stefan Schramm^b, Pance Naumov^b, Anna Gudmundsdottir^a

^aUniversity of Cincinnati, 2600 Clifton Ave, Cincinnati, OH 45221, shielddj@mail.uc.edu, gudmunad@ucmail.uc.edu

^bNew York University Abu Dhabi, Saadiyat Marina District, Abu Dhabi, United Arab Emirates

Finding materials that are capable of converting external stimuli, such as light, into motions is of fundamental importance to researchers interested in applications pertaining to sensors, molecular machines, and biomimicking medical devices¹⁻⁴. Much of the research concerning crystalline devices has focused on polymorph switching or reaction strain generation in order to create macroscopic movement^{5,6}. However, another mode of creating motions in crystals by gas release has only been reported once in the literature⁷. This poster will address crystals that create movement by photostimulated gas release. The crystalline movements of three similarly packed vinyl azides were characterized by video microscopy and analyzed in conjunction with nanoindentation, X-ray spectroscopy, and lattice energy calculations. Finally, the reaction mechanism was investigated by nanosecond laser flash photolysis and supported with DFT calculations.

References:

- (1) Yu, Y.; Nakano, M.; Ikeda, T. *Nature* **2003**, *425*, 145.
- (2) Al-Kaysi, R. O.; Tong, F.; Al-Haidar, M.; Zhu, L.; Bardeen, C. J. *Chemical Communications* **2017**, *53*, 2622.
- (3) Ikeda, T.; Mamiya, J.-i.; Yu, Y. *Angewandte Chemie International Edition* **2007**, *46*, 506.
- (4) Juodkazis, S.; Mukai, N.; Wakaki, R.; Yamaguchi, A.; Matsuo, S.; Misawa, H. *Nature* **2000**, *408*, 178.
- (5) Naumov, P.; Chizhik, S.; Panda, M. K.; Nath, N. K.; Boldyreva, E. *Chemical Reviews* **2015**, *115*, 12440.
- (6) Commins, P.; Desta, I. T.; Karothu, D. P.; Panda, M. K.; Naumov, P. *Chemical Communications* **2016**, *52*, 13941.
- (7) Ovcharenko, V. I.; Fokin, S. V.; Fursova, E. Y.; Kuznetsova, O. V.; Tretyakov, E. V.; Romanenko, G. V.; Bogomyakov, A. S. *Inorganic Chemistry* **2011**, *50*, 4307.