

Ultra-bright, non-hygroscopic, high performance 0D all-inorganic lead-free perovskite Cs₃Cu₂I₅:Tl scintillator for efficient radio-voltaic and other applications of radiation detection

Henry Chen¹, Withold Palosz¹, Julie Wen¹, Sue Kutcher¹, Sudhir Trivedi¹, Uwe Hommerich²

¹*Brimrose Technology Corp, 19 Loveton Circle, Sparks, MD 21152, USA*

²*Hampton University, Hampton, Virginia 23668, USA*

Corresponding Author Email: henryc@brimrose.com

To the best of our knowledge, we are one of the first, if not first, research company in the US to successfully grow ultra-bright, non-hygroscopic, highly efficient and high performance 0D inorganic lead-free single crystal perovskite Cs₃Cu₂I₅:Tl scintillator using the simple, scalable vertical Bridgman method. This next generation scintillator not only is air-stable, has good stopping power and has excellent scintillation detector performance (very bright, ultra-low afterglow, very high energy resolution (< 2%), better than all COTS scintillator known today). The material also exhibits great gamma-particles pulse shape discrimination capability with the gamma-alpha PSD figure of merit being 3.5. This new material thus offers breakthroughs in many areas of nuclear radiation detection applications include x-ray imaging, highly sensitive and high energy resolution gamma spectroscopy in high energy/nuclear physics as well as efficient triboluminescent nuclear battery for security and defense usages.