

Abstract Submitted  
for the APR20 Meeting of  
The American Physical Society

**Instantaneous Colorimetric Visual Detection of Toxic Lead (II) ions** MD ASHIQUR RAHMAN LASKAR, MD TAWABUR RAHMAN, Electrical Engineering and Computer Science Department, South Dakota State University, ABDULLAH AL MARUF, Physics Department, South Dakota State University, QIQUAN QIAO, Electrical Engineering and Computer Science Department, South Dakota State University — Lead (II) ion ( $\text{Pb}^{2+}$ ) is one of the poisonous heavy metal ions which is detrimental to the human body and the surrounding environment. In this work, a simple and faster colorimetric sensor has been reported to detect the trace amount of toxic  $\text{Pb}^{2+}$  ions. Here, we have utilized Methylammonium Iodide (MAI), dissolved in dimethylformamide solvent, as a sensing material to visually detect toxic  $\text{Pb}^{2+}$  ions instantaneously. When the  $\text{Pb}^{2+}$  ions even at a low level are added to a colorless MAI solution, immediately it forms  $\text{MAPbI}_3$  perovskite precursor solution which has exceptional light absorption property. This light absorption property critically depends on the concentration of added  $\text{Pb}^{2+}$  followed by perovskite precursor formation. Because this phenomenon affects the bandgap of the formed  $\text{MAPbI}_3$  solution. Interestingly, MAI solution with  $\text{Pb}^{2+}$  ions exhibits a transparent yellow color. However, the color saturation varies from strong to light appearance according to the concentration of added  $\text{Pb}^{2+}$  ions. MAI solution generates this unique color characteristic selectively only with  $\text{Pb}^{2+}$  ions in the ambient environment. Depending on this distinguishable color saturation variation, it is possible to detect the presence and level of  $\text{Pb}^{2+}$  ions in a liquid sample within a few seconds through the naked eye. Our successful lowest detection level for  $\text{Pb}^{2+}$  was 10 micromolar.

Md Ashiqur Rahman Laskar  
Electrical Engineering and Computer Science Department, South Dakota State University

Date submitted: 30 Jan 2020

Electronic form version 1.4