# $FeS_2$ PYRITE SOLAR CELL ABSORBER SYNTHESIS AND CHARACTERIZATION

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Solar energy is one of the best ways to combat the current energy crisis and transition into a sustainable energy economy. Although the most popular solar panel material is silicon, there is continuous search for improvement in cost-efficiency, earth abundance, and environmental sustainability for solar cell materials. $FeS_2$ in the pyrite crystal structure is a promising candidate for such a solar cell, as it has the necessary material properties to be used in an efficient solar cell absorber [1]. $FeS_2$ also offers possibilities for electricity production at the lowest price compared with all other solar cell materials [2]. Despite being very promising in theory, pyrite has never been successfully used in an efficient solar cell, due to its unique properties and material defects.

$FeS_2$ crystalline powders as absorber material for monograin layer solar cells were synthesized in the molten phase of potassium iodide, lithium iodide and caesium iodide at 690 °C and in sodium polysulfide at 475 °C. The precursors used in the synthesis were either elemental Fe and S, binary FeS and S, or $FeS_2$ in a recrystallization step. The materials were characterized by photoluminescence and Raman spectroscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, and the impurities concentrations were quantified by the TOF-SIMS measurements. First monograin layer solar cells based on pyrite microcrystals were fabricated with a *p*-type nickel oxide buffer layer, which was deposited by pulsed laser deposition. The results of these experiments will be presented in poster form during the conference.

References

[1] L. Yu *et al.*, "Iron Chalcogenide Photovoltaic Absorbers," *Advanced Energy Materials*, vol. 1, no. 5, Oct. 2011, doi: 10.1002/aenm.201100351.

[2] C. Wadia *et al*, "Materials Availability Expands the Opportunity for Large-Scale Photovoltaics Deployment," *Environmental Science & Technology*, vol. 43, no. 6, Mar. 2009, doi: 10.1021/es8019534.