ЛИЧНОЕ СОГЛАСИЕ ОФИЦИАЛЬНОГО ОППОНЕНТА

В диссертационный совет 24.1.116.01 (Д 002.085.01)

Я, Куклин Сергей Александрович, доктор химических наук, старший научный сотрудник Лаборатории физической химии полимеров ФГБУН Института элементоорганических соединений им. А. Н. Несмеянова Российской академии наук, даю свое согласие выступить в качестве официального оппонента по диссертации Балакирева Дмитрия Олеговича «Синтез сопряженных донорно-акцепторных тиофенсодержащих олигомеров линейного и звездообразного строения для нефуллереновых органических солнечных батарей» на соискание ученой степени кандидата химических наук по специальности 1.4.7 – высокомолекулярные соединения.

По теме рассматриваемой диссертации за последние 5 лет имею более 20 научных работ, в том числе:

1. M. L. Keshtov, **S. A. Kuklin**, Y. Zou, H. Dahiya, A. Agrawal, G. D. Sharma. Wide bandgap d-a copolymers with same medium dithieno [2,3-e;3′2′-g]isoindole-7,9 (8h) acceptor and different donors for high-performance fullerene free polymer solar cells with efficiency up to 14.76%. Chemical Engineering Journal, 2022, 427:131404.
2. M. L. Keshtov, **S. A. Kuklin**, A. Agrawal, H. Dahiya, F. Chen, G. D. Sharma. Ternary polymer solar cells based on wide bandgap and narrow bandgap non-fullerene acceptors with an efficiency of 16.40 % and a low energy loss of 0.53 ev. Materials Today Energy, 2021, 21:100843.
3. M. L. Keshtov, **S. A. Kuklin**, A. R. Khokhlov, D. Yu Godovsky, I. O. Konstantinov, I. E. Ostapov, Zh Xie, G. D. Sharma. New random terpolymers based on bis(4,5-didodecylthiophen-2-yl)-[1, 2, 5]thiadiazolo [3,4 i]dithieno[3,2-a:2',3'-c]phenazine with variable absorption spectrum as promising materials for organic solar cells. Doklady Physical Chemistry, 2021, 496(1):1–7.
4. G. D. Sharma, H. Dahiya, M. L. Keshtov, **S. A. Kuklin**. Ternary polymer solar cells using two polymers p1 and p3 with similar chemical structures and nonfullerene acceptor attained power conversion efficiency over 15.5% with low energy loss of 0.55 ev. ENERGY TECHNOLOGY, 2021, 9(2), 2000926.
5. M. L. Keshtov, **S. A. Kuklin**, I. E. Ostapov, M. I. Buzin, V. G. Alekseev, P. V. Komarov, Ch Dou, Hemraj Dahiya, and Ganesh D. Sharma. Tetraperylenediimide derivative as a fullerene-free acceptor for a high-performance polymer solar cell with the high-power

conversion efficiency of 10.32% with open-circuit voltage over 1.0 v. Optical Materials, 2021, 115:111048.

6. M. L. Keshtov, I. O. Konstantinov, **S. A. Kuklin**, A. R. Khokhlov, I. E. Ostapov, A. S. Peregudov, M. I. Buzin, C. Dou, H. Dahiya, G. D. Sharma. Ternary polymer solar cells with high open circuit voltage containing fullerene and new thieno[3',2',6,7][1]benzothieno[3,2-b]thieno[3,2-g][1]benzothiophene-based non-fullerene small molecule acceptor. ENERGY TECHNOLOGY, 2021, 2001100.
7. M. L. Keshtov, **S. A. Kuklin**, A. R. Khokhlov, A. S. Peregudov, F. C. Chen, Z. Xie, G. D. Sharma. Efficient ternary polymer solar cell using wide bandgapconjugated polymer donor with two non-fullerene smallmolecule acceptors enabled power conversion efficiency of 16% with low energy loss of 0.47 ev. Nano Select, 2021, 2(4):1–10.
8. M. L. Keshtov, **S. A. Kuklin**, A. R. Khokhlov, Z. Xie, C. Dou, Y. Zou, I. E. Ostapov, E. E. Makhaeva, R. Suthar, G. D. Sharma. Synthesis and photovoltaic investigation of 8,10-bis(2-octyldodecyl)-8,10-dihydro-9h-bisthieno[2,3:7,8,3,2:5,6] naphtho[2,3-d]imidazol-9-one based conjugated polymers using a nonfullerene acceptor. ACS Applied Energy Materials, 2020,3(1):495–505.
9. M. L. Keshtov, **S. A. Kuklin**, I. O. Konstantinov, A. R. Khokhlov, Z. Xie, C. Dou, E. N. Koukaras, R. Suthar, G. D. Sharma. Synthesis and photovoltaic properties of new conjugated d-a polymers based on the same fluoro-benzothiadiazole acceptor unit and different donor units. ChemistrySelect, 2020, 5(2):853–863.
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11. M. L. Keshtov, **S. A. Kuklin**, C. Dou, E. N. Koukaras, R. Singhal, P. Malhotra, G. D. Sharma. Enhancement of photovoltaic efficiency through fine adjustment of indacene-based non-fullerene acceptor by minimal chlorination for polymer solar cells. Nano Select, 2020, 1(3):320–333.
12. M. L. Keshtov, **S. A. Kuklin**, I. E. Ostapov, E. E. Makhaeva, R. Suthar, C. Dou, G. D. Sharma. New high bandgap 8,10-dihydro-9h-bistieno[2',3':7.8;3",2":5.6]naphtho[2,3-d] imidazole-9-one based donor-acceptor copolymers for non-fullerene polymer solar cells. ENERGY TECHNOLOGY, 2020, 202000611.
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15. M. L. Keshtov, **S. A. Kuklin**, I. O. Konstantinov, I. E. Ostapov, D. Y. Godovsky, E. E. Makhaeva, Z. Xie, G. D. Sharma. Conjugated random terpolymers based on benzodithiophene, diketopyrrolopyrrole, and 8,10-bis(thiophen-2-yl)-2,5-di(nonadecan-3-yl)bis[1,3]thiazolo[4,5- f :5$prime$,4$prime$- h]thieno[3,4- b]quinoxaline for efficient polymer solar cell. Journal of Polymer Science, Part A: Polymer Chemistry, 2019, 57:1478–1485.
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18. **S. A. Kuklin**, I. O. Konstantinov, A. S. Peregudov, I. E. Ostapov, E. E. Makhaeva, A. R. Khokhlov, M. L. Keshtov. Bis[1,3]thiazolo[4,5-f:5',4'-h]thieno[3,4-b]quinoxaline derivatives as new building blocks of polymers for organic electronics. Doklady Chemistry, 2018, 482(1):207–211.
19. M. L. Keshtov, A. R. Khokhlov, **S. A. Kuklin**, A. Yu Nikolaev, E. N. Koukaras, G. D. Sharma. Dithienosilole–phenylquinoxaline-based copolymers with d-a-d-a and d-a structures for polymer solar cells. Journal of Polymer Science, Part A: Polymer Chemistry, 2018, 56(4):376–386.
20. M. L. Keshtov, I. O. Konstantinov, **S. A. Kuklin**, A. R. Khokhlov, N. V. Nekrasova, Z. Xie, E. N. Koukaras, G. D. Sharma. Synthesis and photovoltaic properties of new d-a copolymers based on 5,6-bis(2-ethylhexyl)naphtha[2,1-b:3,4-b′]dithiophene-2,9-diyl] donor and fluorine substituted 6,7-bis(9,9-didodecyl-9h-fluoren-2-yl)[1,2,5] thiadiazolo[3,4-g]quinoxaline acceptor units. Journal of Polymer Science, Part A: Polymer Chemistry, 2018, 56(12):1297–1307.
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containing fluorinated side chains of thiadiazoloquinoxaline acceptor and benzodithiophene donor units. New Journal of Chemistry, 2018, 42:1626–1633.

Настоящим подтверждаю, что не являюсь членом экспертного совета ВАК

5 апреля 2022 г. Куклин Сергей Александрович

Подпись С. А. Куклина заверяю

Специалист по кадрам
Девлятбаева Э.С.
Дата 05.04.2022