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This volume contains the papers presented at , 6th International Conference on Electrical, Electronic and Computing , (Ic)ETLAN 2019 in conjunction of ETRAN 63rd National Conference on Electrical, Electronic and Computing Engineering held on June 3-6, 2019 in Veliko Gradište.

There were 247 submissions. Each submission was reviewed by at least 1, and on the average 2, reviewers. The committee decided to accept papers as follows. Invited papers are included and presented as papers in Sessions.

During the Conferences were held three Special Sessions:

- **Special Session dedicated to academician Rajko Tomović**

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Moderators:

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Prof. Vladimir Srdić: **Ultrafast Spin Dynamics in Multiferroic Oxides;**

Prof. Petar Uskoković: **Synthesis and Supercapacitive performances of Electrospun Carbon Nanofibers Decorated with Spinel  $\text{Co}_{1.5}\text{Mn}_{1.5}\text{O}_4$  Nanocrystals**

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August 27, 2019

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Boris Loncar



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# Radon exhalation from fly-ash geopolymer mortar

*Luka Rubinjoni, Igor Čeliković, Gordana Tanasijević, Miroslav Komljenović, Boris Lončar*

**Abstract**—Geopolymers are a type of alkali activated binders, inorganic aluminosilicate polymers with amorphous cross-linked structure. Fly-ash is produced in abundance during coal firing, and poses an environmental and health risk in untreated powder form. Fly-ash geopolymer presents a sustainable alternative to Portland cement, due to lower net greenhouse gas emissions. Presence of naturally occurring radioactive elements in fly-ash is one of the factors taken into account when estimating the safety of fly-ash based building materials. Radon, a radioactive noble gas originating from the decay of radium, can leave the material and contribute to internal dose in closed spaces, so radon exhalation is of special interest. Radon exhalation for a standard sample of fly-ash geopolymer mortar was measured.

**Index Terms**— geopolymer; fly-ash; radon exhalation

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| Ambrozic, Vanja               | 292           |
| Andrejević Stošović, Miona    | 422           |
| Andrić, Milenko               | 816           |
| Antić, Dragan                 | 196           |
| Antić, Marija                 | 780, 786, 983 |
| Antonijević, Marko            | 186, 191      |
| Antonijević, Milos            | 1045          |
| Antonijević, Dunja            | 689           |
| Arsic, Sladjana               | 1045          |
| Bajcetic, Jovan               | 1015          |
| Bako, Miroslav                | 938, 956      |
| Banjac, Zoran                 | 360           |
| Bankovic, Bojan               | 281, 315      |
| Banović, Radenko              | 947           |
| Basicevic, Ilija              | 829, 860, 863 |
| Basta, Nikola                 | 97            |
| Bašičević, Ilija              | 934           |
| Beracka, Igor                 | 341, 448      |
| Bikit, Istvan                 | 688           |
| Bikit-Schroeder, Kristina     | 688           |
| Bjekić, Miroslav              | 321           |
| Bjelica, Milan                | 942, 947      |
| Bjelić, Milos                 | 69            |
| Bjelić, Miloš                 | 40, 46, 75    |
| Bogdanovic, Natasa            | 863           |
| Bokan, Dejan                  | 811           |
| Bondzulic, Boban              | 401           |
| Bondžulić, Boban              | 816           |
| Bozić, Miloš                  | 321           |
| Bošković, Marko               | 579           |
| Bošković-Vragolović, Nevenka  | 665           |
| Božović, Predrag M.           | 692           |
| Brankovic, Veselin            | 605           |
| Brindić, Branislav            | 560           |
| Brkušnin, Mirko               | 906           |
| Bujaković, Dimitrije          | 816           |
| Bulat, Marina                 | 503           |
| Buljević, Anja                | 164           |
| Будимир, Ђурађ                | 630           |
| Cetic, Nenad                  | 741           |
| Ciganović, Igor               | 751           |
| Ćirić, Vladimir               | 835           |
| Cirovic, Natasa               | 1054          |
| Cirovic, Zoran                | 1054          |
| Crittenden, Alex              | 435           |
| Crnadak, Veljko               | 614           |
| Crnobrnja, Gorana             | 1025, 1030    |
| Crnojevic-Bengin, Vesna       | 80            |
| Cselyuszk, Norbert            | 80            |
| Cvejic, Filip                 | 264           |
| Cvetanovic, Ruzica            | 264           |
| Cvetanović Zobenica, Katarina | 571, 584      |
| Cvetanović-Zobenica, Katarina | 570, 579      |
| Cvetic, Jovan                 | 103           |
| Cvetić, Jovan                 | 111           |
| Cvetičanin, Stevan            | 411           |

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| Чабаркапа, Милан         | 630          |
| Їарко, Darko             | 170, 276     |
| Їelebić, Vladimir        | 52           |
| Їeliković, Igor          | 689, 1083    |
| Їiča, Zoran              | 1009         |
| Їatić, Vladimir          | 52           |
| Їetenović, Dragan        | 330          |
| Їirić, Dejan             | 12           |
| Damnjanović, Đorđe       | 17, 960      |
| Danković, Danijel        | 601          |
| Davidovic, Nikola        | 855          |
| Davidović, Vojkan        | 601          |
| Dejanović, Darko         | 947          |
| Denic, Dragan            | 532          |
| Dimitrijević, Marko      | 422          |
| Dinic, Miodrag           | 916, 920     |
| Dinkic, Jelena           | 89           |
| Dinkić, Jelena           | 115          |
| Djordjevic, Ana          | 35           |
| Djuric, Zoran            | 571          |
| Dlabac, Tatjana          | 292          |
| Dlabač, Tatijana         | 93           |
| Došlić, Sretenka         | 983          |
| Dodevska, Zorica         | 1084         |
| Dragojevic, Marko        | 757          |
| Draskovic, Drazen        | 895          |
| Draskovic, Slobodan      | 224          |
| Draženović, Branislava   | 219          |
| Drljaca, Mihailo         | 80           |
| Du, Dajun                | 439          |
| Dubajić, Žarko           | 491          |
| Džepina, Vladimir        | 231          |
| Đorić-Veljković, Snežana | 601          |
| Đorđević, Ana            | 12           |
| Đorđević, Antonije       | 89, 115, 636 |
| Đorđević, Borislav       | 855          |
| Đorđević, Branko         | 886          |
| Đorđević, Miloš          | 646          |
| Đukić, Miodrag           | 805          |
| Đumić, Dalibor           | 983          |
| Đurović, Željko          | 138          |
| Egelja, Maksim           | 796          |
| Elhasaeri, Asem          | 154          |
| Erdeljan, Aleksandar     | 276          |
| Erić, Miljko             | 23, 75, 994  |
| Fecht, Hans              | 652          |
| Fei, Minrui              | 439          |
| Filipovic, Filip         | 281, 315     |
| Filipović, Ana           | 584          |
| Filipović, Dragan        | 93           |
| Filipović, Filip         | 309          |
| Frantlović, Miloš        | 571, 575     |
| Furtula, Sergej          | 866          |
| Gajinović, Duško         | 487          |
| Galović, Slobodanka      | 1048         |
| Gavrovska, Ana           | 386, 391     |
| Gazivoda, Nemanja        | 479          |
| Gligoric, Marijana       | 952          |
| Glisic, Djordje          | 952          |
| Glišić, Đorđe            | 805, 871     |
| Gogić, Aleksandar        | 231          |

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| Golubović, Dragan            | 994           |
| Golubović, Snežana           | 601           |
| Gomes, Pedro                 | 822           |
| Gordić, Zaviša               | 726           |
| Graovac, Stevica             | 174           |
| Grbic, Nemanja               | 1000          |
| Grbić, Nemanja               | 1005          |
| Grbić, Tatjana               | 170, 538      |
| Gutai, Ivan                  | 494           |
| Gvero, Milan                 | 934, 947      |
| Hadzic, Enisa                | 916           |
| Hadžijevski, Ljupčo          | 235           |
| Hadžić, Enisa                | 920           |
| Hew A Kee, Gardelito         | 800           |
| Huseinbegović, Senad         | 219           |
| Ignjatovic, Milan            | 103           |
| Ignjatović, Milan            | 111           |
| Ilic, Filip                  | 186, 191      |
| Ilic, Nemanja                | 132           |
| Ilic, Uros                   | 297           |
| Ilić, Uroš                   | 303, 309      |
| Ilić, Velibor                | 901           |
| Ivankovic, Milos             | 860           |
| Ivanović, Sandra             | 780           |
| Ivkovic, Dejan               | 148           |
| Jakšić, Branimir             | 1036          |
| Jakšić, Zoran                | 590           |
| Jambrošić, Kristian          | 63            |
| Janackovic, Djordje          | 671           |
| Janačković, Djordje          | 680           |
| Janačković, Đorđe            | 676           |
| Jančić Heinemann, Radmila    | 1082          |
| Janić, Veljko                | 52            |
| Jankovic, Andrija            | 721           |
| Jankovic, Milica M.          | 239           |
| Janković, Andrija            | 689           |
| Janković, Marija M.          | 692           |
| Janković, Marko              | 29            |
| Janokovic, Nikolina          | 80            |
| Javor, Dario                 | 326           |
| Jevremov, Jovana             | 244, 248, 460 |
| Jevremovic, Aleksandar       | 1045          |
| Jevremović, Aleksandar       | 1065          |
| Jevtić, Sanja                | 680           |
| Ječmenica, Nikola            | 871           |
| Jokanovic, Branka            | 610           |
| Jokic, Ivana                 | 571           |
| Jokić, Vladimir              | 527           |
| Joksimovic, Gojko            | 292           |
| Jordović Pavlović, Miroslava | 1048          |
| Josifovic, Kristina          | 1030          |
| Josifović, Kristina          | 1025          |
| Jovanov, Ninoslav            | 757           |
| Jovanovic, Milos             | 746, 751      |
| Jovanovic, Petar             | 911           |
| Jovanović, Sinisa            | 605           |
| Jovanovic, Ugljesa           | 431           |
| Jovanović, Borisav           | 1081          |
| Jovanović, Goran             | 196           |
| Jovanović, Igor              | 431           |
| Jovanović, Jelena            | 532           |

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| Jovanović, Kosta            | 726, 736 |
| Jovanović, Marija           | 871      |
| Jovanović, Miloš            | 768      |
| Jovanović, Petar            | 906      |
| Jovanović, Željko           | 960      |
| Jović, Neven                | 780      |
| Jović, Vesna                | 584      |
| Kajevic, Aldin              | 292      |
| Kalifa, Mustafa             | 1082     |
| Kandić, Aleksandar          | 689      |
| Kantar, Slađan              | 746      |
| Kapetina, Mirna             | 164      |
| Kaprocki, Nives             | 741      |
| Kaprocki, Zvonimir          | 796      |
| Karadžić, Aleksandra        | 911      |
| Karadžić, Katarina          | 721      |
| Kazuz, Abdulmoneim Mohamed  | 676      |
| Keča Despotović, Aleksandra | 956      |
| Kisic, Emilija              | 224      |
| Kitic, Goran                | 80       |
| Knežević, Jovana            | 705      |
| Knežević, Nikola            | 736      |
| Kocić, Đorđe                | 880      |
| Kojic, Sanja                | 248      |
| Kojić, Sanja                | 244      |
| Kolundžija, Branko          | 97       |
| Komljenović, Miroslav       | 1083     |
| Koprivica, Mladen           | 1020     |
| Kordic, Branislav           | 829      |
| Korolija, Maja              | 715      |
| Kostic, Vojkan              | 315      |
| Kostić, Ivana               | 523      |
| Kostić, Vojkan              | 281      |
| Kovacevic, Branko           | 148      |
| Kovacevic, Jelena           | 866      |
| Kovačević, Aleksandar       | 523, 527 |
| Kovačević, Branko           | 360      |
| Kovačević, Jelena           | 811, 886 |
| Kovačević, Marko            | 923      |
| Krajnović, Nenad            | 966      |
| Krmeta Nikolić, Jelena D.   | 692      |
| Krnjetin, Marko             | 741      |
| Krstajić, Predrag           | 571      |
| Krunic, Momcilo             | 757, 839 |
| Krunic, Vlado               | 839      |
| Krunić, Momčilo             | 774      |
| Krunić, Vlado               | 774      |
| Kukolj, Dragan              | 901      |
| Kušljevic, Miodrag          | 475      |
| Kvaščev, Goran              | 69, 154  |
| Kvrgic, Vladimir            | 1084     |
| Latinovic, Nikola           | 354      |
| Latinović, Nikola           | 341, 448 |
| Lazarevic, Jovana           | 248      |
| Lazarević, Jovana           | 244      |
| Lazic, Aleksandar           | 942      |
| Lazic, Vladislav            | 297      |
| Lazić, Vladislav            | 303, 309 |
| Lazić, Žarko                | 570      |
| Lazovic, Danilo             | 1015     |
| Lazović, Aleksandar         | 235      |
| Lazović, Goran              | 652      |



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| Lebl, Aleksandar       | 988        |
| Lechekhab, Taki Eddine | 201        |
| Lekic, Nikola          | 1000       |
| Lemaić, Dragana        | 1025       |
| Ležaja Zebić, Maja     | 680        |
| Licanin, Marko         | 12, 35     |
| Livada, Branko         | 336, 554   |
| Loncar, Boris          | 721        |
| Lončar, Boris          | 689, 1083  |
| Lukic, Aleksandar      | 901        |
| Lukic, Nemanja         | 757, 796   |
| Lukić, Branko          | 736        |
| Lupšić, Anita          | 239        |
| Lutovac, Miroslav      | 366        |
| Lutovac-Banduka, Maja  | 366        |
| Mademlis, Christos     | 253        |
| Maione, Guido          | 120        |
| Majstorovic, Milivoje  | 726        |
| Maksić, Nataša         | 972        |
| Malti, Rachid          | 213        |
| Manojlovic, Predrag    | 626        |
| Manojlović, Stojadin   | 201        |
| Mančić, Dragan         | 431        |
| Marceta, Zoran         | 890        |
| Margaritoff, Petra     | 822        |
| Marin, Petar           | 341, 448   |
| Marinković, Aleksandar | 1082       |
| Marinković, Slavica    | 381        |
| Marjanovic, Aleksandra | 158        |
| Marjanović, Aleksandra | 154        |
| Marjanović, Miloš      | 564        |
| Marković, Goran        | 1025, 1030 |
| Marković, Maja         | 665        |
| Марковић, Вера         | 630        |
| Markushev, Dragan      | 1048       |
| Matic, Tamara          | 680        |
| Matijasevic, Lazar     | 730        |
| Matić, Marko           | 1025       |
| Matić, Milica          | 786        |
| Mihajlov, Darko        | 35         |
| Mihajlović, Veljko     | 239        |
| Mihic, Marko           | 1084       |
| Mihić, Velibor         | 792        |
| Mijailović, Daniel     | 661        |
| Mijić, Miomir          | 23, 40, 46 |
| Mijušković, Filip      | 443        |
| Mikluc, Davorin        | 201        |
| Milanović, Miloš       | 875        |
| Milanović, Petar       | 350, 800   |
| Milenković, Srđan      | 1081       |
| Milenković, Vladeta    | 287        |
| Milentijevic, Ivan     | 835        |
| Miletić, Miljan        | 29         |
| Miletić, Miloš         | 164        |
| Miletić, Vesna         | 680        |
| Mileusnić, Mladen      | 988        |
| Milic, Miljana         | 435        |
| Milic, Zoran           | 435        |
| Milivojević, Milan     | 386        |
| Milivojčević, Marko    | 58         |
| Milić, Boško           | 983        |
| Milićević, Đorđe       | 906        |

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| Miličević, Zoran                    | 1009           |
| Miljković, Tatjana                  | 40, 46, 69, 75 |
| Milosavljevic, Ivan                 | 605            |
| Milosavljevic, Milan                | 354            |
| Milosavljevic, Natasa               | 377            |
| Milosavljević, Aleksandar           | 1069, 1075     |
| Milosavljević, Milan                | 1065           |
| Milosavljević, Čedomir              | 219            |
| Milosevic, Branka                   | 610            |
| Milosevic, Tomislav                 | 618            |
| Milovanovic, Gradimir               | 111            |
| Milovanovic, Marko                  | 890            |
| Milovanović, Lara                   | 938            |
| Milovanović, Vladimir               | 426            |
| Milošević, Marina                   | 960            |
| Milošević, Milena                   | 901            |
| Milošević, Ognjen                   | 929            |
| Milošević, Đurađ                    | 1069           |
| Mirković, Dejan                     | 416            |
| Mirković, Stefan                    | 498            |
| Misic, Marko                        | 929            |
| Мишић, Јелена                       | 630            |
| Mišković, Milan                     | 23             |
| Mitić, Darko                        | 196            |
| Mitić, Vojislav                     | 646, 652       |
| Mitrić, Miodrag                     | 661            |
| Mitrovic, Nebojsa                   | 281, 315, 684  |
| Mitrović, Aleksandra                | 164            |
| Mladenović, Ivana                   | 590            |
| Mlikota, Boris                      | 956            |
| Mohr, Markus                        | 652            |
| Mostafa, Medhat Abdelrahman Mohamed | 350            |
| Mrdja, Dusan                        | 688            |
| Mujovic, Sasa                       | 292            |
| Munić, Nenad                        | 523, 527       |
| Nadj, Dejan                         | 942            |
| Nedeljković, Željko                 | 138            |
| Nejkovic, Valentina                 | 1059           |
| Nerandžić, Marko                    | 350, 800       |
| Nesic, Dusan                        | 618            |
| Nesic, Vladimir                     | 952            |
| Neskovic, Aleksandar                | 1020           |
| Nešić, Dušan                        | 623            |
| Nešić, Milutin                      | 381            |
| Nikezic, Dragoslav                  | 710            |
| Nikezic, Dusan                      | 721            |
| Nikitovic, Zeljka                   | 657            |
| Nikolic, Dejan                      | 1000           |
| Nikolic, Dimitrije                  | 911            |
| Nikolić, Dejan                      | 1005           |
| Nikolić, Dragan                     | 107            |
| Nikolić, Tatjana                    | 196            |
| Nikolić, Veljko                     | 523, 527       |
| Nikolov, Rade                       | 560            |
| Novakovic, Djordje                  | 503            |
| Novaković, Jovana                   | 52             |
| Novaković, Đorđe                    | 456            |
| Novković, Teodora                   | 906            |
| Obradov, Marko                      | 590            |
| Obradovic, Slobodan                 | 855            |
| Obradović, Nina                     | 636            |
| Olćan, Dragan                       | 89             |

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| Orelj, Jelena          | 684           |
| Orlić, Vladimir        | 1005          |
| Padjen, Nedeljko       | 354           |
| Panic, Vesna           | 671           |
| Panić, Vesna           | 665           |
| Pantelić, Filip        | 58            |
| Pantić, Dragan         | 560           |
| Pap, Ištvan            | 875           |
| Papp, Ištvan           | 780           |
| Paunović, Vesna        | 646, 652      |
| Pavić, Branislav       | 988           |
| Pavlovic, Aleksandra   | 377           |
| Pavlovic, Dragan       | 103           |
| Pavlovic, Milos        | 345           |
| Pavlović, Aleksandra   | 366           |
| Pavlović, Dragan       | 111           |
| Pavlović, Ivan         | 381           |
| Pavlović, Miloš        | 341           |
| Pavlović, Roman        | 786, 875      |
| Pejić, Dragan          | 479           |
| Pekez, Nenad           | 886           |
| Peng, Chen             | 439           |
| Peric, Dragana         | 354           |
| Peric, Miroslav        | 345           |
| Perić, Dragana         | 336           |
| Perić, Ljubiša         | 431           |
| Perić, Miroslav        | 341           |
| Perić, Zoran           | 17            |
| Perišić, Zoran         | 1009          |
| Peruničić, Nemanja     | 456           |
| Petrič, Tadej          | 736           |
| Petronijevic, Milutin  | 281, 297, 315 |
| Petronijević, Milutin  | 303           |
| Petrovic, Nenad        | 1059          |
| Petrovic, Pavle        | 1000          |
| Petrovic, Petar        | 730           |
| Petrovic, Vera         | 224           |
| Petrović, Bojan        | 244           |
| Petrović, Mile         | 1036          |
| Petrović, Nenad        | 762, 845, 880 |
| Petrović, Nikola       | 426, 479      |
| Petrović, Pavle        | 1005          |
| Petrović, Predrag      | 988           |
| Petrović, Rada         | 676, 680      |
| Pečšić, Ivan           | 661           |
| Pilipović, Miloš       | 851           |
| Pjanović, Rada         | 665           |
| Plahćinski, Aleksandar | 805           |
| Planić, Bratislav      | 52            |
| Pluškoski, Aleksandar  | 751           |
| Podunavac, Ivana       | 248           |
| Popadić, Ilija         | 350, 448, 800 |
| Popovic, Ivanka        | 671           |
| Popovic, Marko         | 829           |
| Popovic, Miroslav      | 829, 839, 920 |
| Popović, Andrej        | 811           |
| Popović, Dejan         | 231           |
| Popović, Ivan          | 439, 443      |
| Popović, Katarina      | 391           |
| Popović, Marica        | 1048          |
| Popović, Nenad         | 626           |
| Popović, Nikola        | 158, 180      |

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| Popović-Maneski, Lana         | 235            |
| Prascevic, Momir              | 35             |
| Predic, Bratislav             | 923            |
| Predić, Bratislav             | 1069           |
| Prijić, Aneta                 | 564            |
| Prijić, Zoran                 | 564, 646       |
| Prodanović, Lazar             | 276            |
| Protić, Jelica                | 929            |
| Radjenović, Branislav         | 584            |
| Radmilović, Vuk               | 596            |
| Radmilović-Radjenović, Marija | 584            |
| Radojević, Vesna              | 661, 1082      |
| Radonic, Vasa                 | 80, 248        |
| Radonjic, Aleksandar          | 471            |
| Radonjic, Mario               | 956            |
| Radosavljevic, Zvonko         | 148            |
| Radosavljević, Nevena         | 923            |
| Radovanovic, Milos            | 610            |
| Radovanović, Lidija           | 676            |
| Radovanović, Željko           | 676            |
| Radović, Maja                 | 960            |
| Radulović, Katarina           | 570, 571, 575  |
| Raičević, Nebojša             | 326            |
| Rajačić, Milica M.            | 692            |
| Rajs, Vladimir                | 475            |
| Rakić, Aleksandar             | 439            |
| Ralić, Marko                  | 52             |
| Randjelović, Danijela         | 575            |
| Ranitović, Predrag            | 774            |
| Ranković, Aleksandar          | 330            |
| Ranđelović, Danijela          | 579            |
| Rapaić, Milan                 | 164, 213, 411  |
| Raslijić, Milena              | 584            |
| Rašljjić, Milena              | 570, 579       |
| Redžović, Hasan               | 978            |
| Reljin, Branimir              | 386            |
| Reljin, Irini                 | 386, 391       |
| Rikalo, Aleksandar            | 911            |
| Ristić, Dušan                 | 407            |
| Rodić, Aleksandar             | 768            |
| Roganović, Miloš              | 923            |
| Rosić, Marko                  | 321            |
| Rubinjoni, Luka               | 689, 721, 1083 |
| Rudović, Ognjen               | 180            |
| Ružičić, Rosa                 | 467            |
| Salai, Lana                   | 875            |
| Salom, Iva                    | 52             |
| Samardzija, Dragan            | 916            |
| Sarajlić, Milija              | 575, 579       |
| Sarap, Nataša B.              | 692            |
| Savic, Milan                  | 396            |
| Savić, Milan                  | 938            |
| Serizel, Romain               | 1              |
| Seslija, Sanja                | 671            |
| Silva, Hugo                   | 822            |
| Simic, Aleksandar             | 345            |
| Simić, Slobodan               | 201, 407       |
| Skoric, Bojan                 | 855            |
| Sladojević, Lazar             | 287            |
| Smiljakovic, Vladimir         | 452            |
| Smiljanić, Aleksandra         | 972, 978       |
| Smiljanić, Milče              | 570, 575, 579  |

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| Smiljanić, Milče M.          | 584        |
| Sokola, Matija               | 471        |
| Sovilj, Platon               | 460        |
| Spalević, Petar              | 1036       |
| Spasojević, Pavle            | 671        |
| Spasojević, Pavle            | 665        |
| Stamenkovic, Negovan         | 396        |
| Stankic, Milan               | 839        |
| Stankovic, Koviljka          | 701        |
| Stankovic, Milos             | 132        |
| Stankovic, Srdjan            | 132, 345   |
| Stankovic, Zoran             | 1015       |
| Stanković, Aleksandra        | 560        |
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