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Supplementary materials

Structural and transport properties of La tungstate and its composite with nickel (II) and copper (II) oxides

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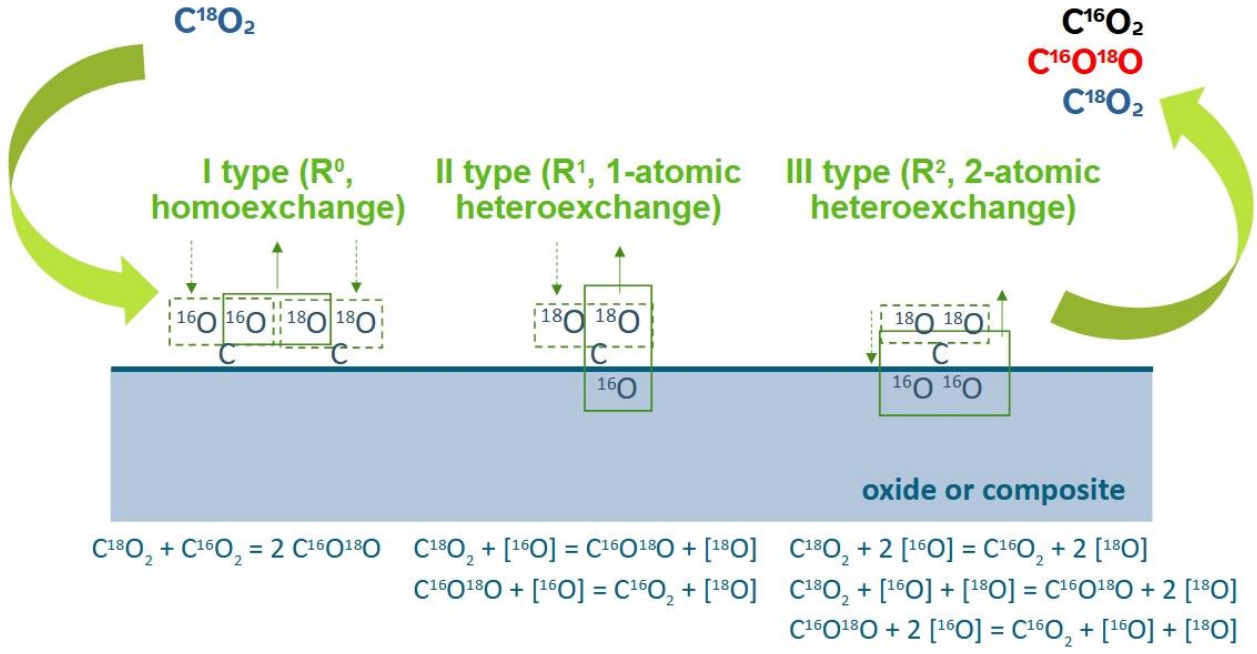


Figure S1 Principle of isotope exchange of oxygen with $C^{18}O_2$ and three types of exchange mechanisms according to the Muzykantov's classification [S1].

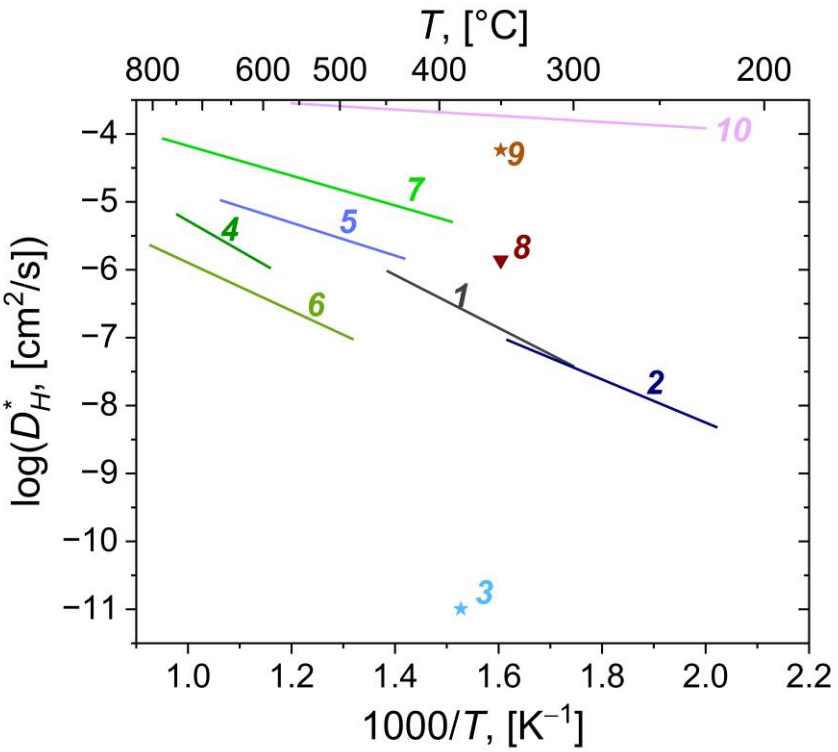
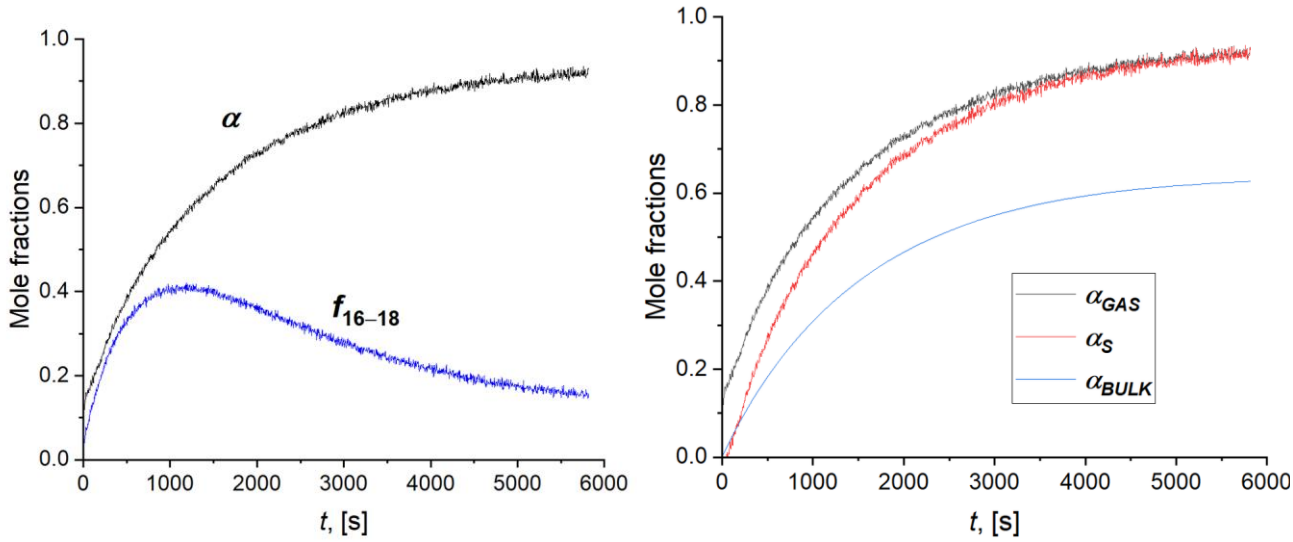
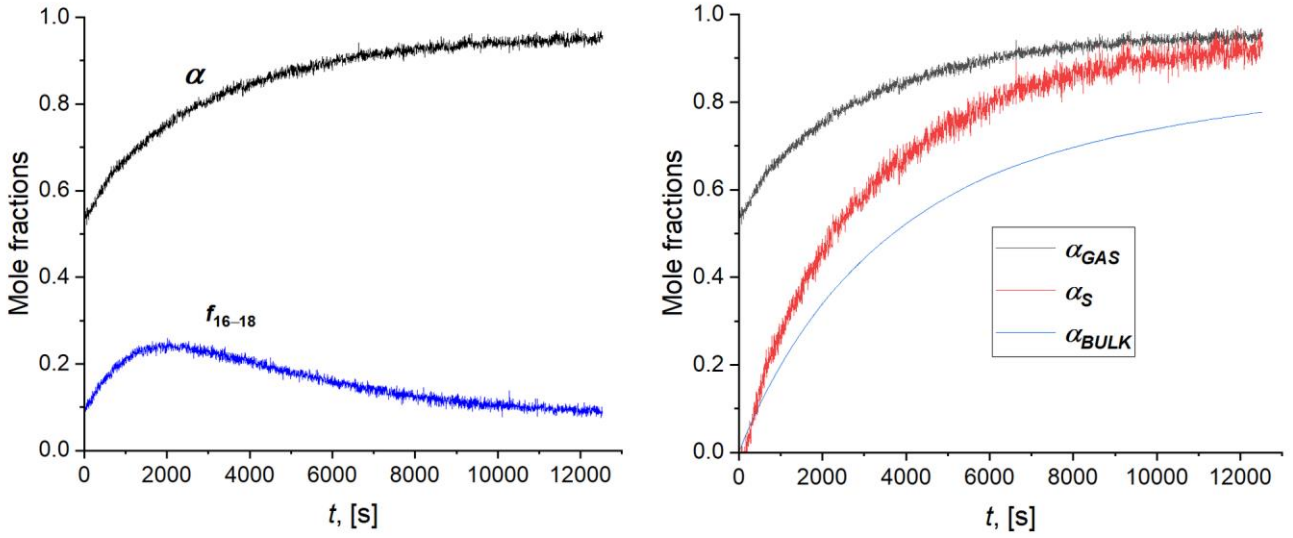


Figure S2 Arrhenius plots for hydrogen tracer diffusion coefficient values for various proton-conducting materials: *1* – $La_{27.15}W_{4.85}O_{55-\delta}$ [S2]; *2* – $La_{27.15}W_{4.85}O_{55-\delta}$ [S3]; *3* – $Nd_{5.5}WO_{11.25-\delta}$ [S4]; *4* – $Sr_{1.95}Fe_{1.5}Mo_{0.5}O_{6-\delta}$ [S5,S6]; *5* – $BaCe_{0.9}Y_{0.1}O_{3-\delta}$ [S5,S7], *6* – $La_{0.91}Sr_{0.09}ScO_{3-\delta}$ [S8]; *7* – Ni [S5,S9]; *8* – $Cu_{0.447}Pd_{0.553}$ [S10]; *9* – $Cu_{0.554}Pd_{0.446}$ [S10]; *10* – V [S11].



(a) **(b)**

Figure S3 The experimental time dependencies of ^{18}O and $^{16}O^{18}O$ fractions in the gas phase (a), and ^{18}O fraction in the gas phase, on the sample surface and in the sample bulk (b) for LWO sample according to IIE with $^{18}O_2$ at 800 °C.



(a) **(b)**

Figure S4 The experimental time dependencies of ^{18}O and $^{16}O^{18}O$ fractions in the gas phase (a), and ^{18}O fraction in the gas phase, on the sample surface and in the sample bulk (b) for LWO_{RT} sample according to IIE with $^{18}O_2$ at 800 °C.

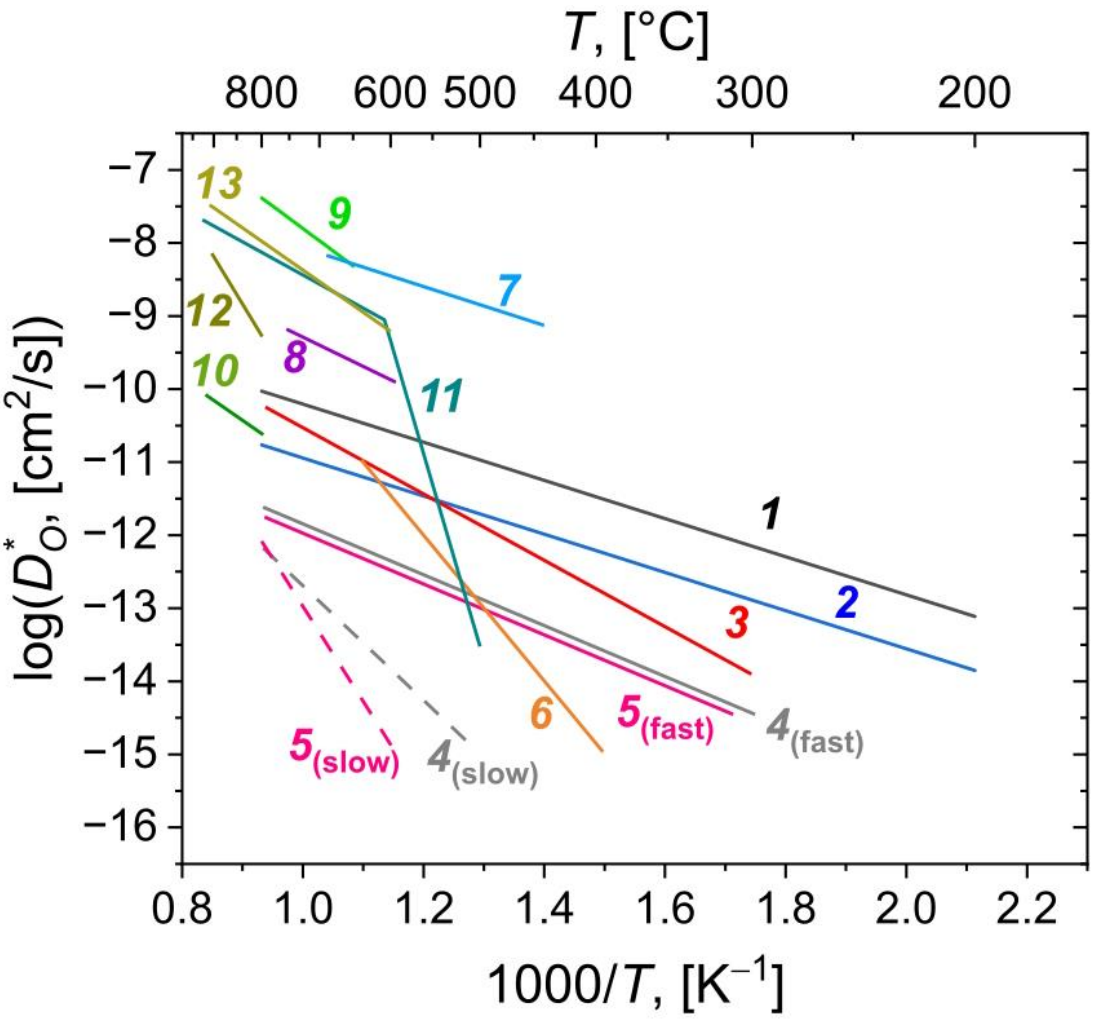


Figure S5 Arrhenius plots for oxygen tracer diffusion coefficient values for various proton-conducting materials: *1* – $La_{27}W_5O_{55.5-\delta}$ (LWO, this work); *2* – $La_{27}W_5O_{55.5-\delta}$ (LWO_{RT}, this work); *3* – $Er_{5.5}MoO_{11.25-\delta}$ [S12]; *4* – $La_{0.99}Ca_{0.01}NbO_4$ [S13]; *5* – $La_{0.99}Ca_{0.01}NbO_4$–$LaNb_3O_9$ [S13]; *6* – $Sm_{1.9}Ca_{0.1}ScTaO_{7-\delta}$ [S14]; *7* – $La_{9.83}Si_5Al_{0.75}Fe_{0.25}O_{26.5}$ [S15], *8* – $Ca_3Co_4O_{9\pm\delta}$ [S16]; *9* – $Sr_{1.95}Fe_{1.4}Ni_{0.1}Mo_{0.5}O_{6-\delta}$ [S17]; *10* – $BaZr_{0.80}Y_{0.20}O_{3-\delta}$ [S18]; *11* – $BaCe_{0.9}La_{0.1}O_{3-\delta}$ [S19]; *12* – $LaScO_{3-\delta}$ [S20]; *13* – $La_{0.91}Sr_{0.09}ScO_{3-\delta}$ [S20].

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