Supplementary materials

Depolymerization of Pine Wood Organosolv lignin in Ethanol Medium over NiCu/SiO_2 and NiCuMo/SiO_2 Catalysts. Impact of Temperature and Catalyst Composition

Angelina V. Miroshnikova[1,3], Sergey V. Baryshnikov[1], Yuriy N. Malyar[1,3], Li Xiaomin[3], Maria V. Alekseeva[2], Boris N. Kuznetsov[1,3], Oxana P. Taran[1,2,3]

[1] Institute of Chemistry and Chemical Technology Siberian Branch, Russian Academy of Sciences, FRC Krasnoyarsk Science Center SB RAS, Akademgorodok 50, Bld. 24, Krasnoyarsk 660036, Russia; miroshnikova.av@icct.krasn.ru (A.V.M.); bsv2861@mail.ru (S.V.B.); yumalyar@gmail.com (Y.N.M.); bnk@icct.ru (B.N.K.); taran.op@icct.krasn.ru (O.P.T),

[2] Federal Research Center "Boreskov Institute of Catalysis", Pr. Akademika Lavrentieva 5, Novosibirsk 630090, Russia; bykova@catalysis.ru (M.V.A); oxanap@catalysis.ru (O.P.T),

[3] Institute of Non-Ferrous Metals and Material Science, Department of Analytical and Organic Chemistry, Siberian Federal University, pr. Svobodny 79, Krasnoyarsk 660041, Russia; li-xiaomin@mail.ru (L.X.)

* Correspondence: miroshnikova35@gmail.com (A.V.M.); taran.op@icct.krasn.ru (O.P.T.)

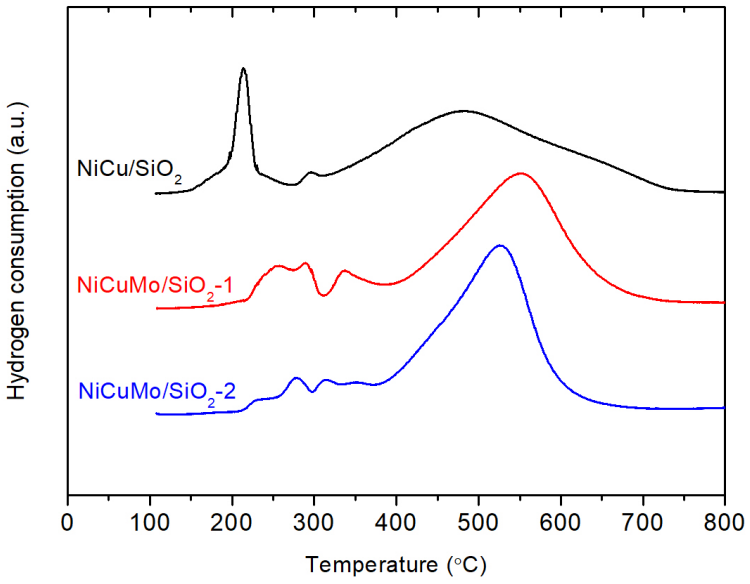


Fig. S1 TPR profiles of the catalysts

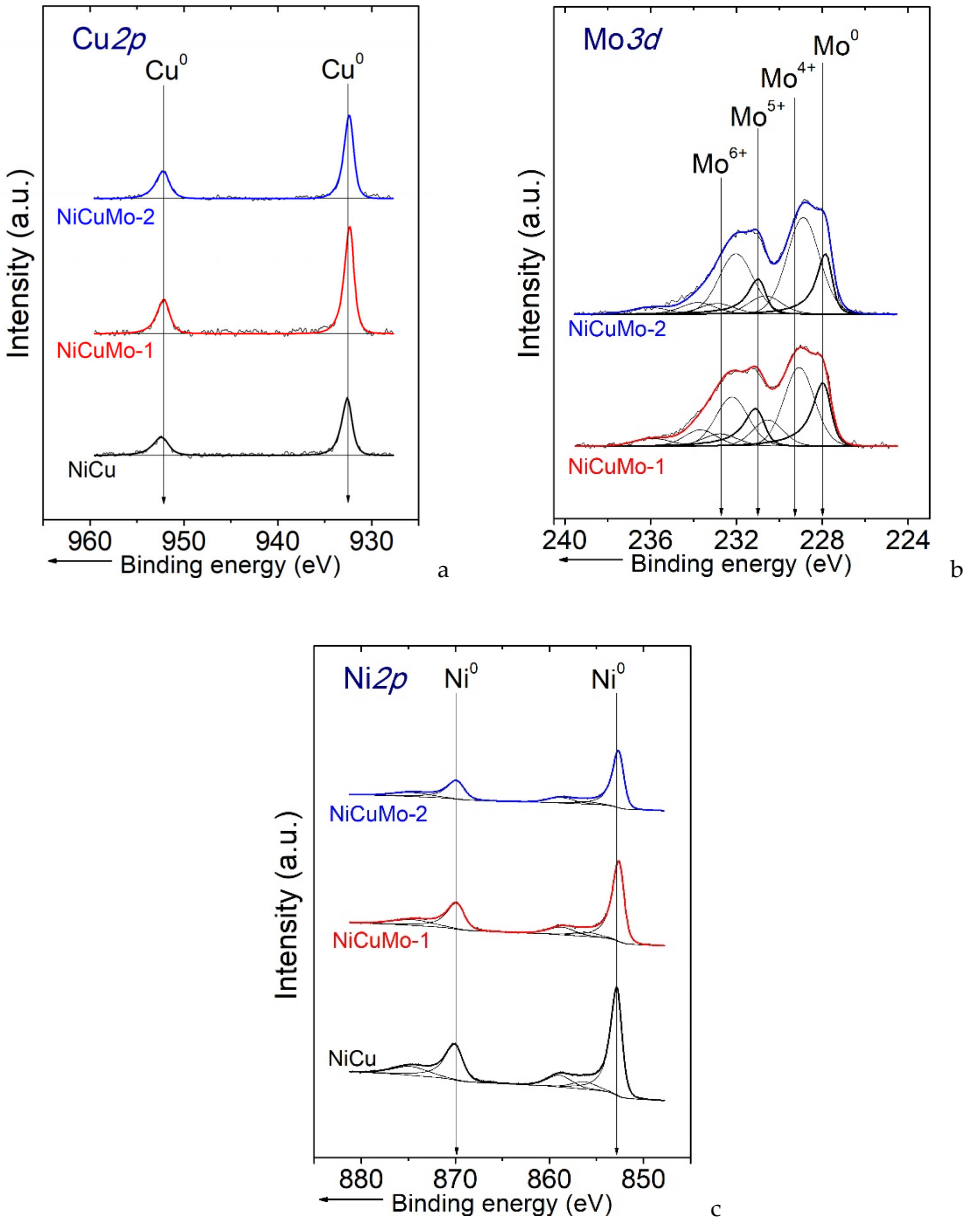
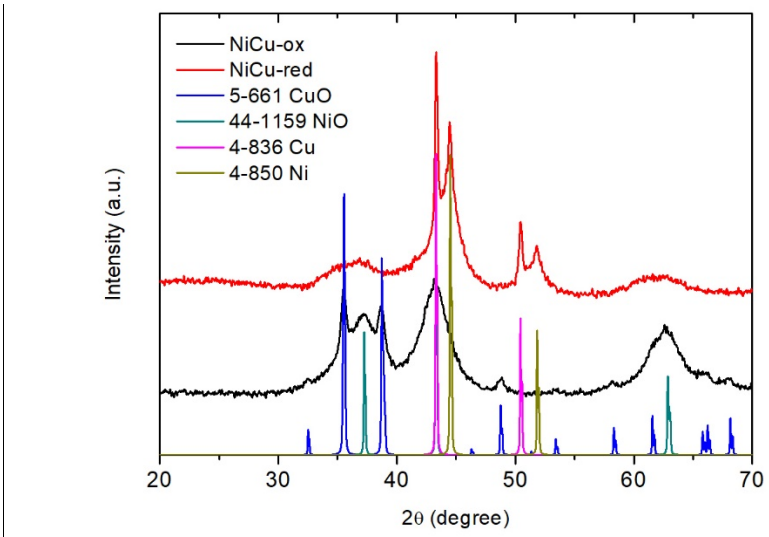
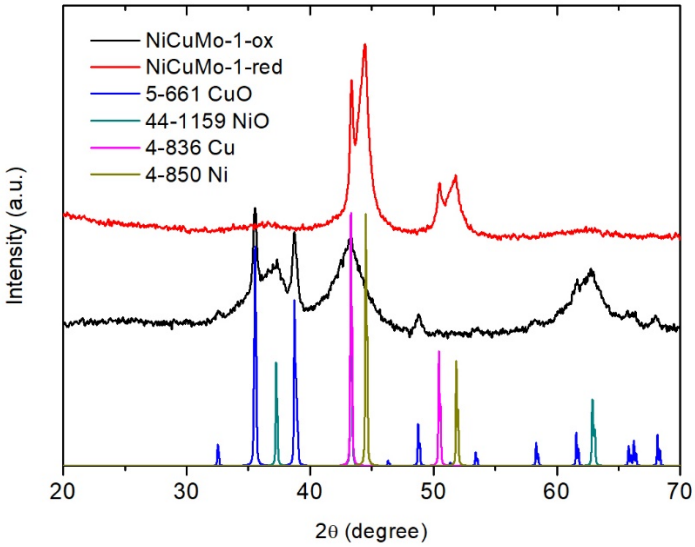


Fig. S2 Cu*2p* (a), Mo*3d* (b), and Ni*2p (c)*XPS spectra of reduced catalysts with the various Mo content



a



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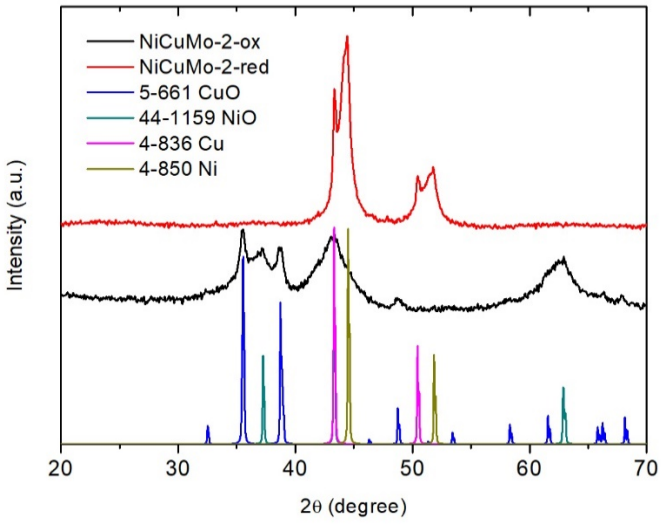

c

Fig. S3 XRD patterns of the catalysts: a) NiCu/SiO_2; b) NiCuMo/SiO_2-1; c) NiCuMo/SiO_2-2

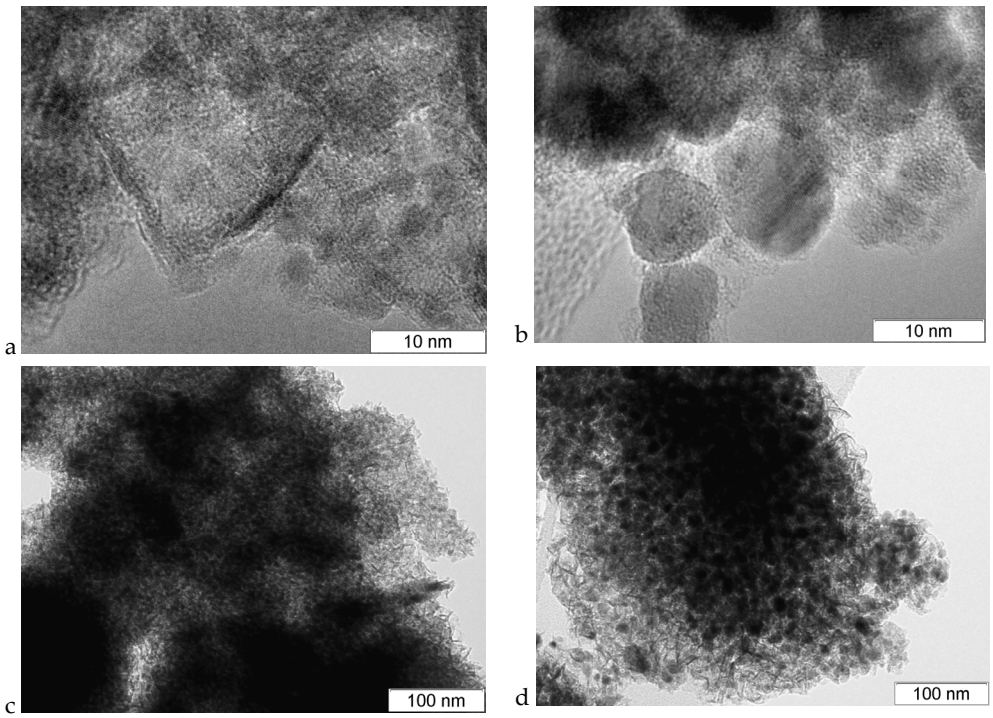

Fig. S4 HRTEM images of the samples a,c) $NiCu/SiO_2$, b,d) $NiCuMo/SiO_2$-1

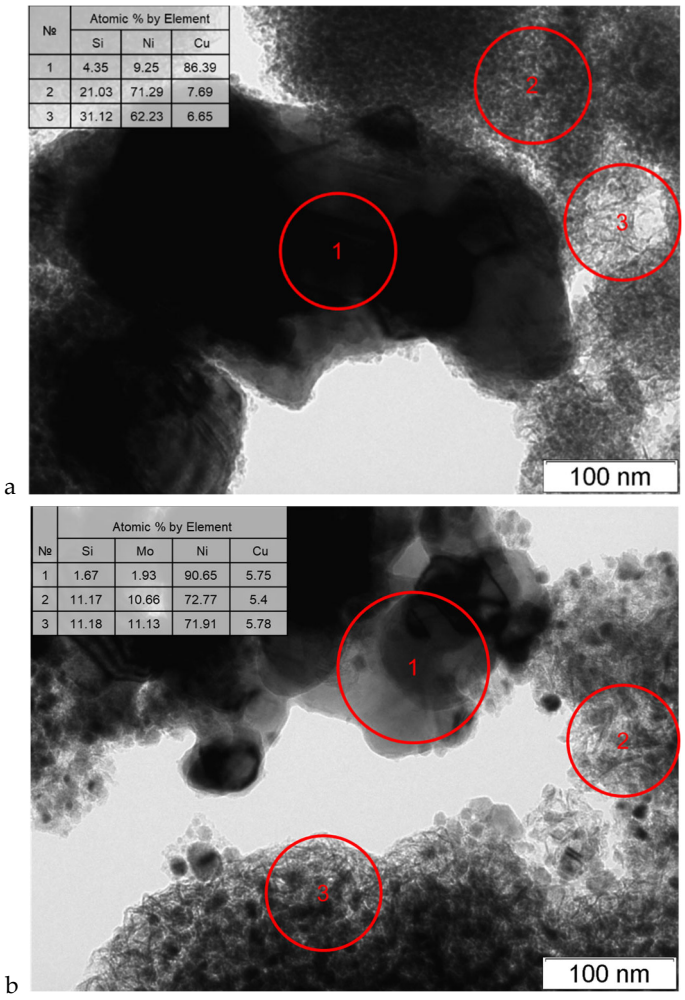

Fig. S5 HRTEM images and EDX of the samples a) $NiCu/SiO_2$, b) $NiCuMo/SiO_2$-1

Table S1. The composition and texture characteristics of the catalysts*.

Catalyst	Composition of catalysts, wt.%				Mo/Ni atomic ratio	S_{BET}, m^2/g	V_{Σ}, cm^3/g	V_{micro}, cm^3/g	$<d>_{pore}$, Å
	Ni	Cu	Mo	Si					
$NiCu/SiO_2$	56	8.2	-	8.5	-	174.6	0.21	0.01	48
$NiCuMo/SiO_2$-1	49	7.1	8.8	7.4	0.11	115.0	0.22	0.01	83
$NiCuMo/SiO_2$-2	46	6.7	11.7	7.0	0.16	109.0	0.23	0.01	83

* S_{BET} is specific surface area according to BET, V_{Σ} total pore volume, V_{micro} micropore volume, <d> average pore size.

Table S2. Yields of products of thermal and catalytic conversion of pine ethanol lignin in supercritical ethanol medium. Reprinted with permission from Ref. [1]

T, °C	Catalyst	Yields, wt %					
		Liquids	Solids	Gaseous			
				CO	CO_2	CH_4	Sum
250	No catalyst	68.2	29.5	< 0.1	< 0.1	< 0.1	0.1
	$NiCu/SiO_2$	68.9	27.1	0.3	0.1	0.2	0.6
	$NiCuMo/SiO_2$-1	69.4	26.3	0.2	0.1	0.1	0.4
300	No catalyst	63.4	31.8	< 0.1	0.1	0.1	0.3
	$NiCu/SiO_2$	78.0	15.8	3.4	1.2	2.4	7.0
	$NiCuMo/SiO_2$-1	83.5	7.9	2.3	1.6	2.1	6.0
	$NiCuMo/SiO_2$-2	83.0	8.9	2.2	1.7	2.0	5.9
	$NiCu/SiO_2$*	75.5	14.5	3.6	0.8	2.9	7.3
	$NiCuMo/SiO_2$-1*	80.9	9.7	3.0	1.3	2.7	7.0
350	No catalyst	51.1	44.7	1.0	0.5	0. 9	2.4
	$NiCu/SiO_2$	80.6	1.0	7.1	1.9	3.5	11.5
	$NiCuMo/SiO_2$-1	82.5	0.8	5.0	2.4	3.3	10.7
	$NiCuMo/SiO_2$-2	77.9	6.3	4.5	2.7	3.0	10.2

*Regenerated catalyst

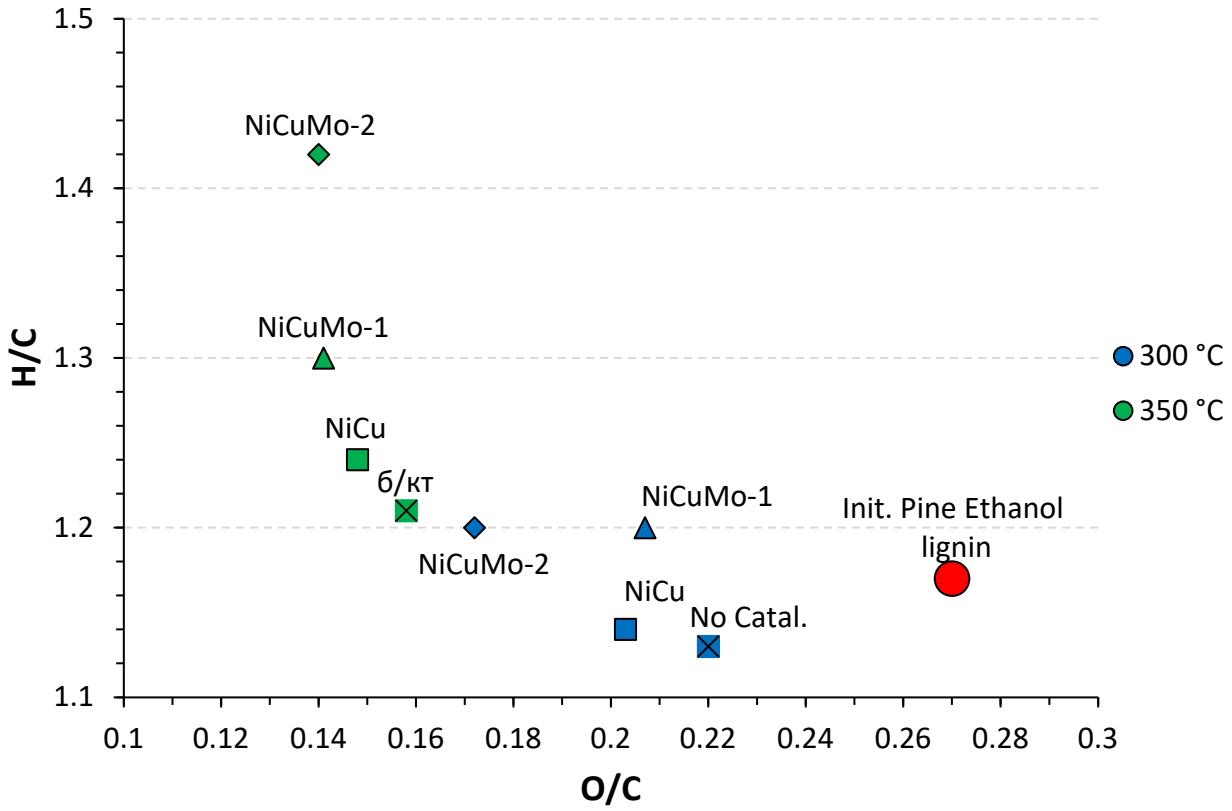

Fig.S6 Van Crevelen diagram for liquid products obtained from pine ethanol lignin over the $NiCu/SiO_2$ and $NiCuMo/SiO_2$ catalysts with different Mo content at 300 and 350 ºC Reprinted with permission from Ref.[1]

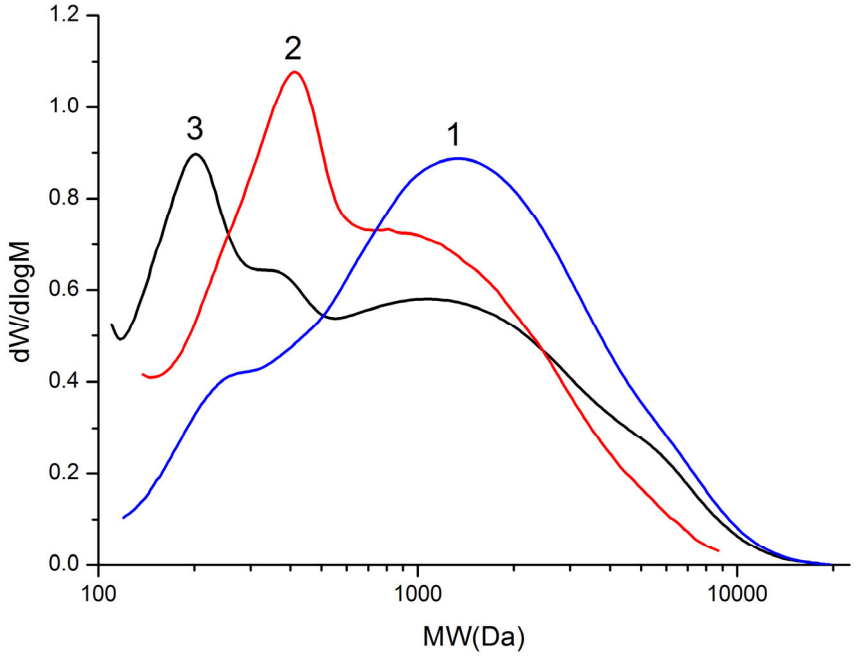

Fig.S7 Molecular mass distribution in initinal pine ethanol lignin (1); liquid products obtained at 300 ºC over $NiCu/SiO_2$ (2) and $NiCuMo/SiO_2$-1 (3) catalysts. Reprinted with permission from Ref.[1]

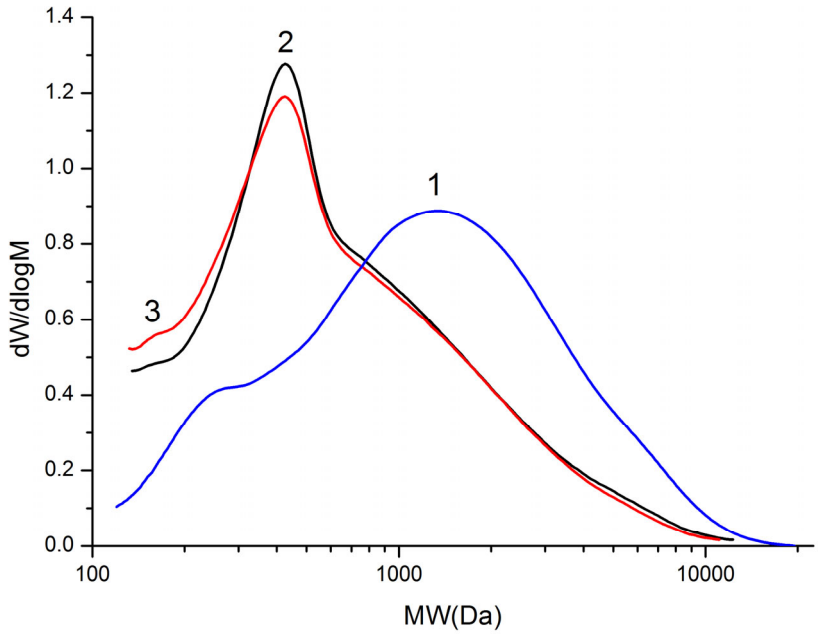

Fig.S8 Molecular mass distribution in initinal pine ethanol lignin (1); liquid products obtained at 350 ºC over $NiCu/SiO_2$ (2) and $NiCuMo/SiO_2$-1 (3) catalysts. Reprinted with permission from Ref. [1]

1. Miroshnikova, A.V.; Baryshnikov, S.V.; Malyar, Y.N.; Yakovlev, V.A.; Taran, O.P.; Djakovitch, L.; Kuznetsov, B.N. Depolymerization of Pine Ethanol Lignin in the Medium of Supercritical Ethanol in the Presence of Catalysts $NiCu/SiO_2$ and $NiCuMo/SiO_2$. *Journal of Siberian Federal University. Chemistry* **2020**, *13*, 247-259.