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Supplementary material

Catalytic Ability of K- and Co-Promoted Oxo-Re and Oxo-ReMo Nanosized Compositions for Water–Gas Shift Reaction

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Table S1. Catalyst composition determined by XRF.

Sample/spot	Element concentration (wt %)							
	Re	Co	Mo	K	Re_2O_7	CoO	MoO_3	K_2O
CoRe								
spot 1	86.11	13.89	-	-			-	-
spot 2	85.68	14.32	-	-			-	-
Average	**85.90**	**14.11**	**-**	**-**	**15.76**	**2.53**	**-**	**-**
CoReMo								
spot 1	47.27	15.82	36.81	-				
spot 2	50.75	19.60	29.65	-				
Average	**49.01**	**17.71**	**33.23**	**-**	**12.24**	**4.32**	**9.57**	**-**
K-CoRe								
spot 1	54.20	17.22	-	28.58				
spot 2	46.04	20.09	-	33.87				
Average	**50.12**	**18.66**	**-**	**31.23**	**11.90**	**4.34**	**-**	**6.86**
K-CoReMo			-					
spot 1	22.41	14.20	32.34	31.05				
spot 2	29.45	13.62	27.02	29.91				
Average	**25.93**	**13.91**	**29.68**	**30.48**	**7.87**	**4.13**	**10.40**	**8.58**

After deposition of potassium, deviation from nominal values is related to the effect of X-ray depth penetration.

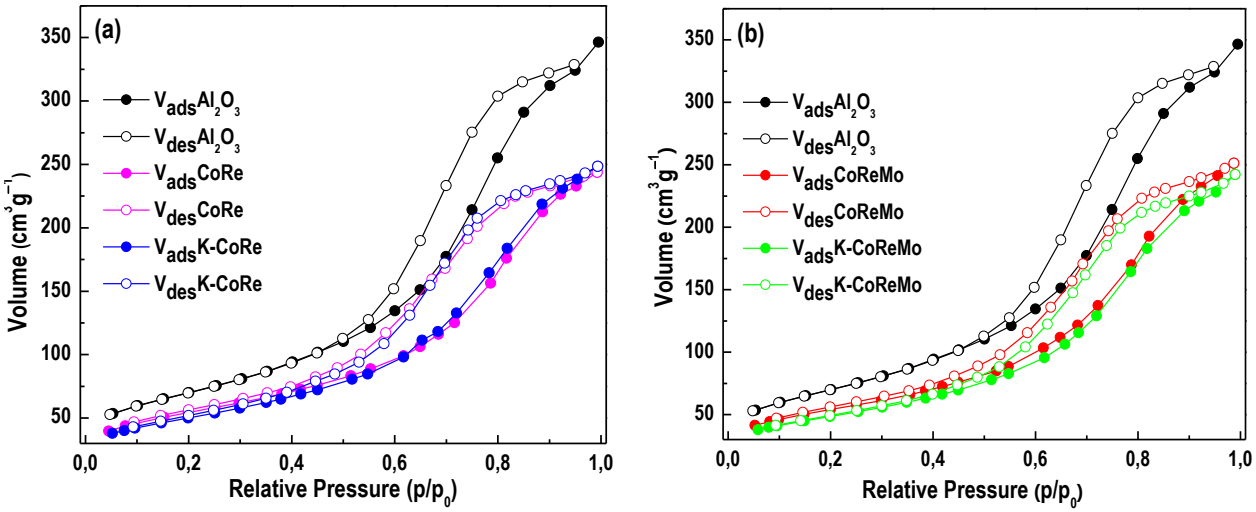

Figure S1. N_2 adsorption-desorption isotherms: (**a**) Al_2O_3 support, CoRe and K-CoRe catalysts; (**b**) Al_2O_3 support, CoReMo and K-CoReMo catalysts.

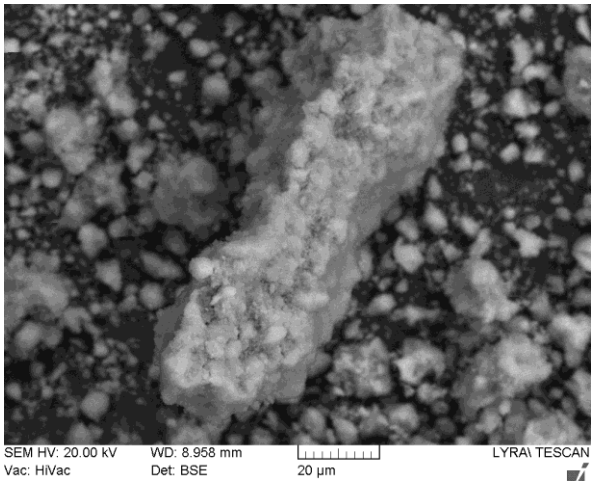

Figure S2. SEM image of γ-Al_2O_3 support

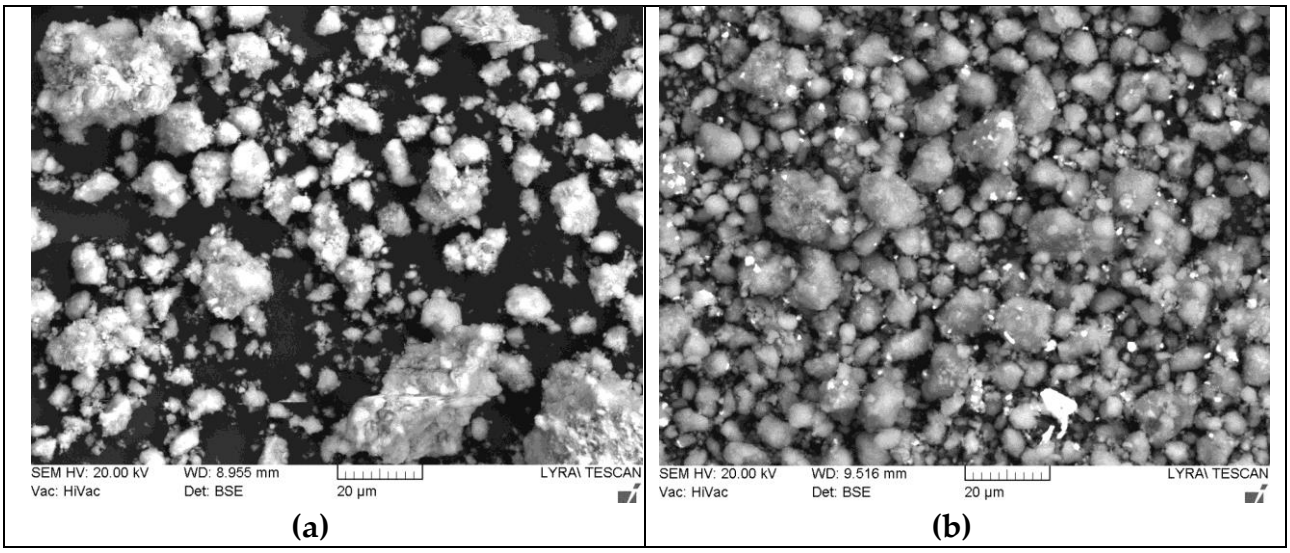

Figure S3. SEM image of: (a) CoRe; (b) K-CoRe.

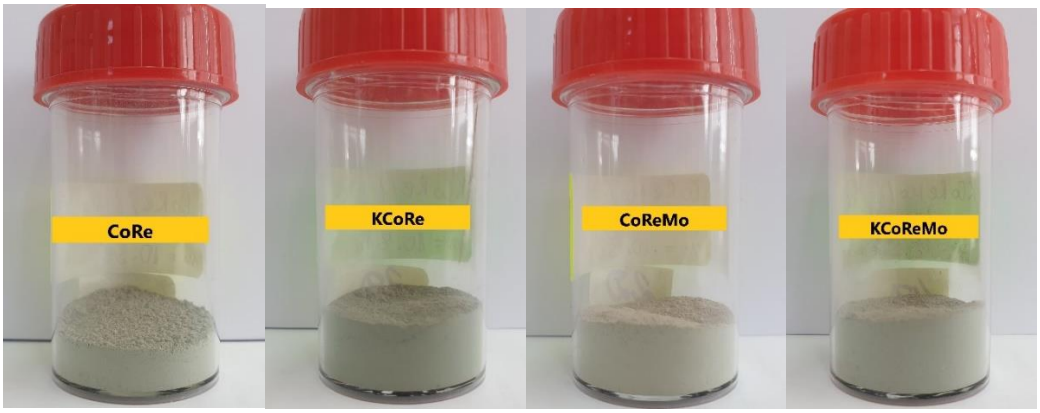

Figure S4. Photos displaying colors of oxide CoRe, K-CoRe, CoReMo, and K-CoReMo catalyst systems.

Table S2. Data on the formed oxide structures

Sample	Formed metal-oxide structures
CoRe	ReO_4^-, non-stoichiometric spinel-like mixed $Co^{2+}(Co^{3+},Al^{3+})_2O_4$ oxide, bed formed Co_3O_4 ($CoO.Co_2O_3$) and $CoAl_2O_4$ spinel structures; ReO_3–O–ReO_3 and Co–Re–O–(Al) surface species
K-CoRe	better formed Co_3O_4 ($CoO.Co_2O_3$) and $CoAl_2O_4$ spinel structures; K(ReO_4); K–Co–Re–O–(Al) surface species
CoReMo	mixture of isolated molybdate MoO_4^- and polymolybdate –MoO_6– structures; Co_3O_4, $CoAl_2O_4$, Co–Re–Mo–O–(Al) and $CoMoO_4$ structures
K-CoReMo	mixture of isolated molybdate MoO_4^- and polymolybdate –MoO_6– structures; K_2MoO_4, K–Co–Re–Mo–O–(Al) and $CoMoO_4$ structures

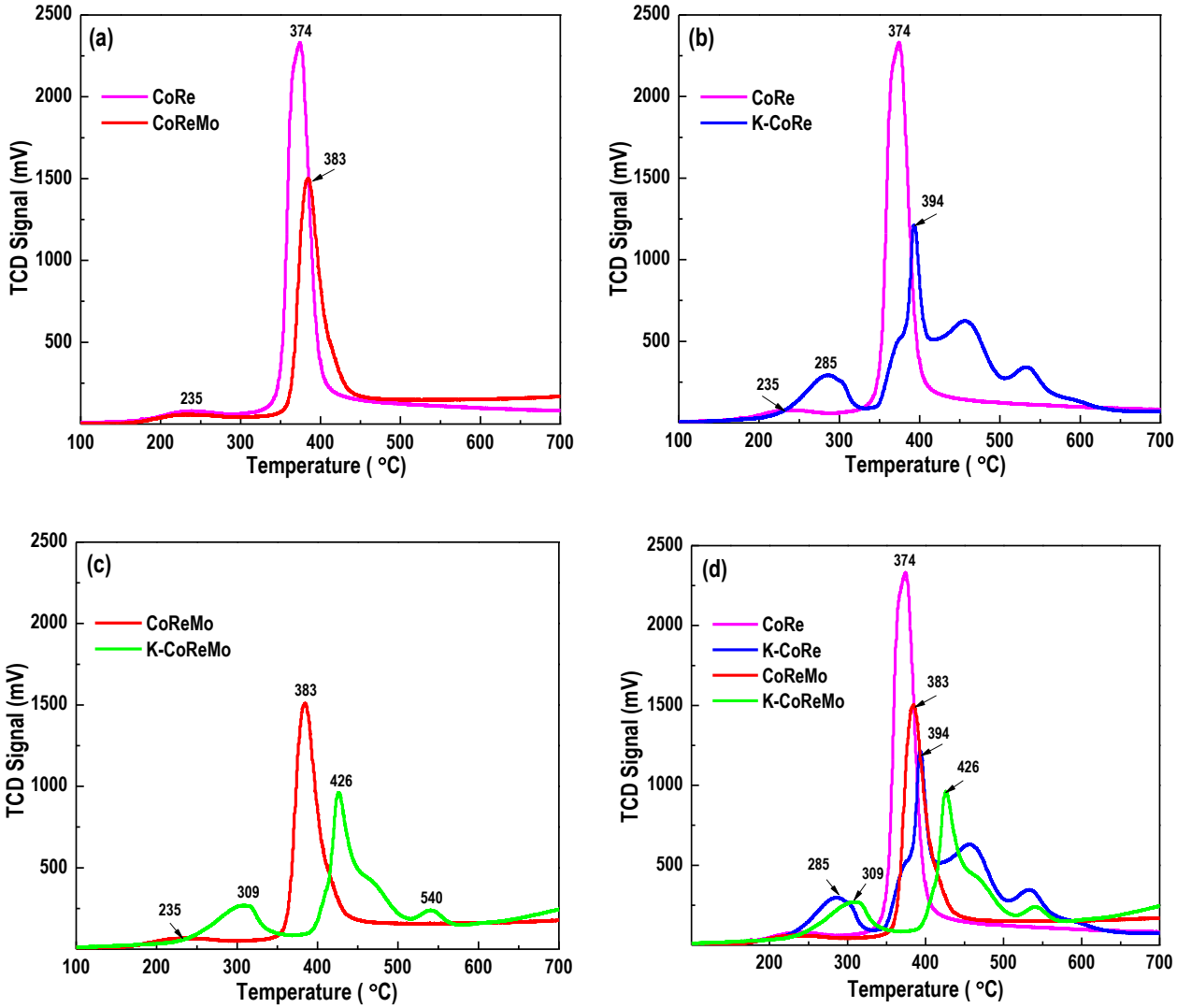

Figure S5. Comparative presentation of H_2-TPR profiles: (**a**) CoRe and CoReMo; (**b**) CoRe and K-CoRe; (**c**) CoReMo and K-CoReMo; (**d**) CoRe, K-CoRe, CoReMo, and K-CoReMo.