Journal of Materials Chemistry C

ARTICLE

Supporting Information/ Electronic Supplementary Information (ESI)

Reversible and repeatable phase transition at negative temperature for doped and co- doped mixed valence vanadium oxide thin films grown on Kapton and Al6061 substrates.

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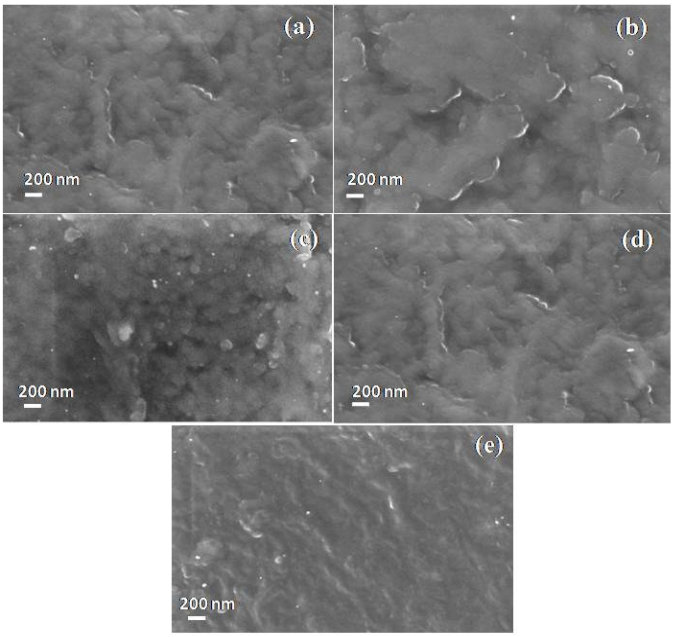

Fig.S1 Typical FESEM images of (a) FVO, (b) Mo-FVO, (c) W-FVO, (d) Ti-FVO and (e) Ti-Mo-FVO thin films on Kapton substrates.

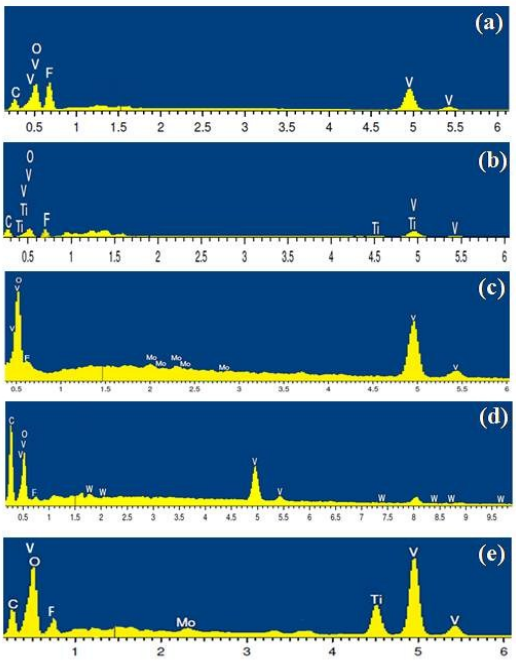

Fig.S2 EDX spectra of (a) FVO, (b) Mo-FVO, (c) W-FVO, (d) Ti-FVO and (e) Ti-Mo-FVO thin films on Kapton substrates.

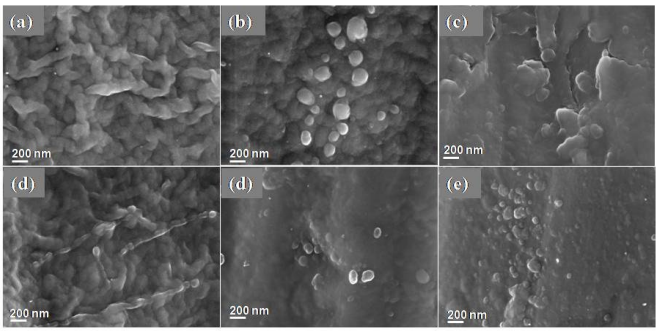

Fig.S3 Typical FESEM images of (a) FVO, (b) Mo-FVO, (c) W-FVO, (d) Ti-FVO, (e)Ti-W-FVO and (f) Ti-Mo-FVO thin films deposited on Al6061 substrates.

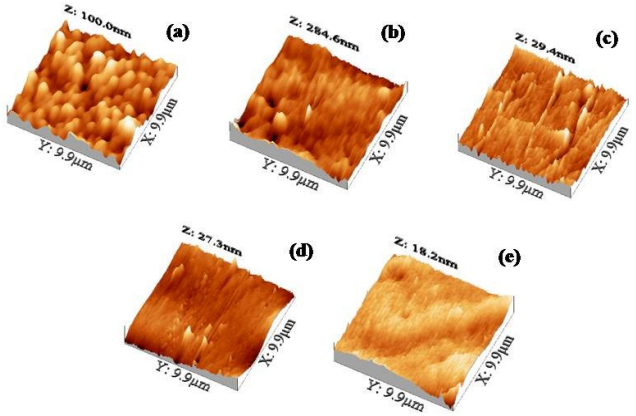

Fig.S4 3D AFM images of (a) FVO, (b) Mo-FVO, (c) W-FVO, (d) Ti-FVO and (e) Ti-Mo-FVO thin films grown on Kapton substrates.

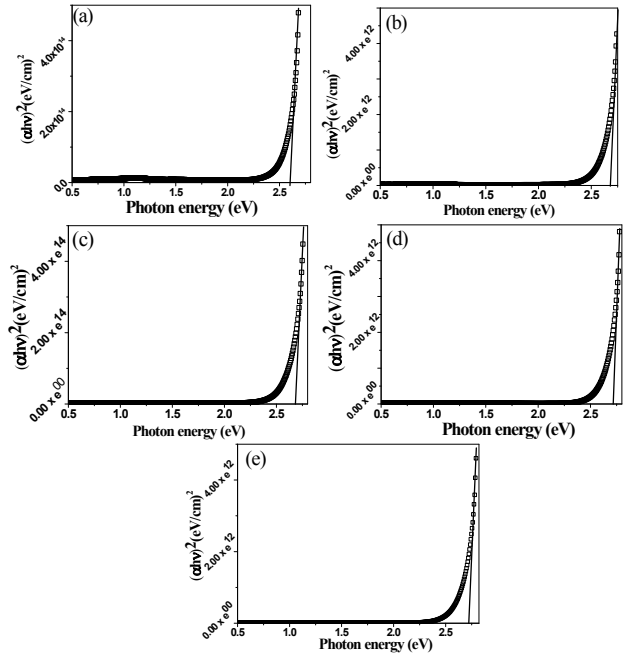

Fig.S5 Plot of $(\alpha h\nu)^2$ versus photon energy for (a) FVO, (b) Mo-FVO, (c) W-FVO, (d) Ti-FVO and (e) Ti-Mo-FVO thin films on Kapton substrates.

Table S1. Binding energies of V species as obtained from V2p core level spectra of doped and co-doped thin films on Kapton substrates.

Systems	V species	Binding energy of $V2p_{3/2}$ (eV)	Relative peak intensity (%)
F VO	V^{5+}	517.4	68
	V^{4+}	516.4	32
Mo-FVO	V^{5+}	517.2	58
	V^{4+}	516.2	42
W -F VO	V^{5+}	517.2	67
	V^{4+}	516.4	33
Ti -FVO	V^{5+}	517.3	67
	V^{4+}	516.4	33
Ti –Mo-FVO	V^{5+}	517.3	69
	V^{4+}	516.0	31

Table S2. Binding energies of V species as obtained from V2p core level spectra of doped and co-doped thin films on Al6061 substrates.

Systems	V species	Binding energy of $V2p_{3/2}$ (eV)	Relative peak intensity (%)
F VO	V^{5+}	517.2	63
	V^{4+}	516	37
Mo-FVO	V^{5+}	517.3	58
	V^{4+}	516.4	42
W -F VO	V^{5+}	517.2	63
	V^{4+}	516.3	37
Ti -FVO	V^{5+}	517	58
	V^{4+}	515.8	42
Ti –W-FVO	V^{5+}	517.2	51
	V^{4+}	516.2	49
Ti –Mo-FVO	V^{5+}	516.1	53
	V^{4+}	517	47