List of Figures

Figures	Title	page
Figure 2-1:	Sankey Diagram of the water resource in India [Source: FAO, 2017]	5
_	India's development scenario projected till 2050 [Source: Amarasinghe et al., 2007]	6
	India's groundwater use predicted till 2050 [Source: Amarasinghe et al., 2007]	6
	Life cycle of water in a fully sourced Delhi household [Source: Water Aid, 2017]	7
•	Coverage of piped and non-piped water [Source : Water Aid, 2017]	8
_	Chemical contaminants present in water, India [Source: Kakoty, 2013]	8
	Plot showing rural populations in India affected by different inorganic contaminants [Source:	
Lo	kSabha, 2017]	9
Figure 2-8	Filtration through the pores [Source: Yakub, 2012]	10
Figure 2-9	Reverse Osmosis and Various filtration mechanisms [Source : Yakub,2012]	11
Figure 2-10	: Flow through a porous media with thickness t [Source : Yakub,2012]	11
Figure 2-11	; 3 kolshi filter [Source : Ahmed, 2001].	13
Figure 2-12	: Biosand Filter [Source : Baig et al., 2011]	14
Figure 2-13	: Kanchan MIT Filter set up [Ngai et al., 2006]	15
	: Arsenic particles effectively adsorbed on the rusted iron nails surface [Source: Ngai, 2002]	15
_	: Ceramic water filter system [Source : Gupta et al., 2018]	16
_	: Diagrammatic representation of adsorption phenomena [Source: Gaspard, 1982]	16
_	: Physisorption phenomena [Source: Gaspard, 1982]	17
	: Chemisorption phenomena [Source: Gaspard, 1982]	17
_	X-ray fluorescence phenomena [Source: Pesce et al., 1971]	21
	X-ray fluorescence instrument AIRF, JNU Delhi	22
_	Line diagram of Energy dispersive XRF spectrometer [Source: Yeung et al., 2003].	22
_	Constructive interference and diffracted rays [Source: Cullity, 2001]	23
_	Bruker's X-ray Diffraction D8-Discover instrument at IIT Jodhpur	24
-	Line diagram of X-ray diffraction instrument working [Source: Cullity, 2001]	25
_	Line diagram showcasing FTIR working principle [Source: Smith, 2011]	26
_	Bruker FTIR spectrometer vertex 70v, IIT Jodhpur	26
	Line Diagram of MIP instrument [Source: Abell et al., 1999]	27
	: Line diagram of Micro-tomography working [Source: Agrawal et al., 2015]	28
_	: MicroCT instrument at BL-4 RRCAT Indore	29
	: Line diagram of SEM instrument [Source: Goldstein et al., 2003]	31
•	: Horizontal placement of ceramic sample over three points [Source: Plappally et al., 2011]	32
	: Representation of clay ceramic sample under compressive force [Source: Plappally et al., 201	_
_	Line diagram of MAS instrument working [Source: Rosenfeld and Zanoni, 1975]	34
_	: Line diagram of AAS instrument working [Source: Van Loon, 2012]	35
_	: AAS 500 spectrophotometer at MRC, MNIT Jaipur Manufacturing of clay ceramics with distinct organic fraction	36
_	Weight variation before and after sintering	39
_	The schematics of the assumed volumes of a frustum, cylinder and square base prism	39
_	: Chemical composition of the Porous Clay Ceramics	41 43
_	: Loading plot showing the Influence of chemicals on the micro-structural properties of clay cer	
_	linitab 16]	44
-	: The score plot of the principal components of the correlated matrix of elemental compositior	
_	ay (1), 350 (2), 450 (3), 500 (4), 550 (5) and 650 (6), respectively [Minitab 16]	45
	: X-ray diffraction pattern of fired ceramics prepared from different raw material compositiona	
_	tios (A) 65 O, (B) 55O, (C) 50O, (D) 45O, and (E) 35O [Origin Pro 16, IIT Jodhpur License]	45
	: Surface Morphology of distinct Porous clay ceramics at 5000X: A) 350, B) 450, C) 50 O, D) 550	
65		46
-	Porosity variation with different ceramic composition	46
_	: Pore-size distribution for ceramics with distinct organic filler (O) content	47
-	: Pore orientation in porous ceramics with distinct organic filler content	47
_	: Surface roughness variation with average porosity	48

Figure 4-13: Compressive strength as a function of surface roughness	49	
Figure 4-14: Fracture toughness as a function of the surface roughness.	49	
Figure 4-15: Fracture toughness as a function of the percentage of organic fraction (sawdust)	50	
Figure 4-16: Filtrate production in different 10 litres capacity clay ceramic filter dried at 850°C	51	
Figure 5-1: Manufacturing of Ferrous mill mixed clay Ceramics	55	
Figure 5-2: XRD pattern of ferrous mill waste and ferrous mixed porous ceramic adsorbent	58	
Figure 5-3: Effect of contact time on the sorption capacity of As (V) ions onto FCC and CC ceramics	58	
Figure 5-4: Pseudo second-order plot of FCC and CC ceramics	59	
igure 5-5: Comparison between surface morphology of ceramics before arsenic treatment a) CC & b) FCC and		
after treatment, c) CC and d) FCC at 500x	60	
Figure 5-6: FTIR spectrum of ferrous ceramic before and after As (V) adsorption	61	
Figure 5-7 : Effect of pH on arsenic removal efficiency	62	
Figure 5-8: Effect of adsorbate concentration on arsenic adsorption of FCC and CC ceramics	63	
Figure 5-9: Freundlich Isotherm plot of FCC and CC	64	
Figure 5-10: Langmuir isotherm for FCC and CC ceramics	65	
Figure 5-11: Comparison of a) compressive and b) flexural strength behaviour of ceramics with and without		
addition of ferrous waste	66	
Figure 6-1: Manufacturing of Clay Ceramics with marble as an additive	69	
Figure 6-2: XRD patterns of a) waste marble powder and b) sintered MCC ceramics.	71	
Figure 6-3: Effect of contact time on arsenic removal efficiency of MCC ceramics	72	
Figure 6-4: Pseudo second order expression for MCC ceramics	73	
Figure 6-5: Surface morphology of MCC ceramics a) before and b) after contact time of 90 mins (20,000X)	74	
Figure 6-6: FTIR spectrum of Marble slurry based ceramic (MCC) before and after As (V) adsorption	74	
Figure 6-7: The influence of initial adsorbate concentration of As (V) removal using MCC ceramics	75	
Figure 6-8: Freundlich Isotherm curve for MCC ceramics	76	
Figure 6-9: Effect of pH on arsenic removal efficiency using MCC ceramics	77	
gure 6-10: Comparison of a) compressive (b) and flexural strength behavior of ceramics with (MCC) and		
without the addition of marble (CC).	78	