

Record 1 of 8**Title:** Influence of Macro-pores on DNAPL Migration in Double-Porosity Soil Using Light Transmission Visualization Method**Author(s):** Alazaiza, MYD (Alazaiza, Motasem Y. D.); Ngien, SK (Ngien, Su Kong); Bob, MM (Bob, Mustafa M.); Kamaruddin, SA (Kamaruddin, Samira A.); Ishak, WMF (Ishak, Wan Mohd Faizal)**Source:** TRANSPORT IN POROUS MEDIA **Volume:** 117 **Issue:** 1 **Pages:** 103-123 **DOI:** 10.1007/s11242-017-0822-3 **Published:** MAR 2017

Abstract: Double porosity is a substantial microstructure characteristic in a wide range of geomaterials. It is a natural phenomenon that can be found in many types of soil, and it can result from biological, chemical or mechanical damage. In this paper, the influence of macro-pores on dense non-aqueous phase liquid (DNAPL) migration in double-porosity medium was investigated using light transmission visualization technique. Three experiments were carried out in two-dimensional flow chambers filled with a double-porosity medium composed of a mixture of local sand and sintered kaolin clay spheres arranged in a periodic manner. In each experiment, a different volumetric fraction of macro-pores and micropores was used. Tetrachloroethylene (PCE) was used to simulate DNAPL, and it was dyed using Oil-Red-O for better visualization. A predetermined amount of PCE was injected into the flow chambers and this amount was re-calculated using image analysis. A very strong correlation was found between the PCE amount injected and the amount calculated from image analysis in each experiment. The experiment was repeated by filling the flow chamber with silica sand to represent single-porosity medium. The results show that the macro-pores have a considerable effect on the PCE migration in double-porosity soil as the PCE movement was the fastest in the third experiment which contained the largest macro-pores volume. The accuracy of the method was validated using statistical analysis. The results show a slight difference between the means of the three experiments, indicating that the method is viable for monitoring NAPL migration in double-porosity medium under different volumetric fractions of macro-pores and micropores.

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ISSN: 0169-3913**eISSN:** 1573-1634**Record 2 of 8****Title:** QUANTIFICATION OF DENSE NONAQUEOUS PHASE LIQUID SATURATION IN DOUBLE-POROSITY SOIL MEDIA USING A LIGHT TRANSMISSION VISUALIZATION TECHNIQUE**Author(s):** Alazaiza, MYD (Alazaiza, Motasem Y. D.); Ngien, SK (Ngien, Su Kong); Bob, MM (Bob, Mustafa M.); Kamaruddin, SA (Kamaruddin, Samira A.); Ishak, WMF (Ishak, Wan Mohd Faizal)**Source:** JOURNAL OF POROUS MEDIA **Volume:** 20 **Issue:** 7 **Pages:** 591-606 **DOI:** 10.1615/JPorMedia.v20.i7.20 **Published:** 2017

Abstract: In this research, the light transmission visualization (LTV) technique was used to measure the dense nonaqueous phase liquid (DNAPL) saturation distribution in a two-dimensional (2-D) flow chamber packed with double-porosity soil medium. This, to the best of our knowledge, is a new application of LTV in measuring DNAPL saturation as well as monitoring its migration in double-porosity soil media. The double-porosity structure was created using layers of fine silica sand and solidified kaolin clay spheres. Tetrachloroethylene (PCE) was used to simulate DNAPL and was dyed with Oil-Red-O for better visualization. Known amounts of PCE were injected into the flow chamber before being correlated to amounts calculated using image analysis based on the LTV method. A strong correlation having an R-2 value of 0.994 was found between the injected PCE volumes and calculated PCE volumes obtained from the LTV method. For comparative purposes, the same experiment was carried out by filling the flow chamber with local silica sand as a single-porosity medium to investigate the influence of soil structure on DNAPL migration. Results, again, showed a strong correlation, with an R-2 value of 0.996, between the amounts of PCE injected into the flow chamber and the calculated amounts of PCE. A significant difference in the migration of PCE in the two experiments was observed as the rate of PCE migration in the double-porosity medium was much faster compared to the migration rate in the single-porosity medium. This finding is most likely due to the occurrence of interaggregate pores in the double-porosity soil. This research proves that the noninvasive and nonintrusive LTV technique can be used to quantify DNAPL saturation in double-porosity soil structure in 2-D, two-phase systems.

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ISSN: 1091-028X**eISSN:** 1934-0508**Record 3 of 8****Title:** Assessment of the behaviour of soil structure in double-porosity kaolin media using light transmission visualization (LTV) method**Author(s):** Alazaiza, MYD (Alazaiza, Motasem Y. D.); Ngien, SK (Ngien, Su Kong); Bob, MM (Bob, Mustafa M.); Kamaruddin, SA (Kamaruddin, Samira A.); Ishak, WMF (Ishak, Wan Mohd Faizal)**Source:** INTERNATIONAL JOURNAL OF GEOTECHNICAL ENGINEERING **Volume:** 11 **Issue:** 3 **Pages:** 316-320 **DOI:** 10.1080/19386362.2016.1211370 **Published:** 2017

Abstract: Double-porosity is a phenomenon that occurs naturally and can be found in many subsurface media such as rock aquifers, agricultural topsoils and compacted soils. These media have different pore size characteristics that result in different hydraulic properties. Two approaches were used to create the double-porosity soil structure using kaolin clay to be tested in migration of contaminant experiments using light transmission visualization (LTV) method. Aggregated kaolin and sintered clayey spheres mixture were used as the media for the first and second test, respectively. The observation shows that the first approach is not viable for a saturated-porous medium because kaolin particles have disintegrated and turned into emulsion. In contrast, uniform kaolin particles that remain strong and solid have been produced using the second approach. In conclusion, the LTV method is viable to monitor the behaviour of fluids in porous media under different conditions.

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Record 4 of 8**Title:** EFFECT OF WEATHERING ON DISINTEGRATION AND SHEAR STRENGTH REDUCTION OF CLAY SHALE**Author(s):** Alatas, IM (Alatas, Idrus M.); Kamaruddin, SA (Kamaruddin, Samira A.); Nazir, R (Nazir, Ramli); Irsyam, M (Irsyam, Masyhur)**Source:** JURNAL TEKNOLOGI **Volume:** 78 **Issue:** 7-3 **Pages:** 93-99 **Published:** 2016

Abstract: Frequent and strong atmosphere and hydrosphere reactions accelerate weathering of clay shale. This study was carried out to determine the effects of frequent natural drying and wetting-drying cycles on clay shales in every 8 days until the value of disintegration ratio, DR reached zero (completely non-durable). Clay shale samples from Semarang-Bawen and Hambalang were tested in the laboratory under four circumstances: (1) without soaking, (2) soaked once in every 8 days, (3) soaked 2 times in every 8 day and (4) soaked 3 times in every 8 days. Disintegration ratio, DR was obtained from the change in grain size distribution of the clay shale due to weathering. Reductions in shear strength of the samples were observed after subjected to wetting-drying cycles. The DR of Semarang-Bawen clay shale reached zero after 32 days, while the DR of Hambalang clay shale showed a range of values between 0.09 and 0.147 on the 80th day. Wetting-drying cycles showed greater impact than natural drying on shear strength parameters reduction. Triaxial tests could only be performed on samples from Semarang-Bawen and Hambalang which were exposed to wetting-drying cycles up to 24 and 32 days of test, respectively beyond which the samples completely disintegrated.

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ISSN: 0127-9696**eISSN:** 2180-3722**Record 5 of 8****Title:** AN OVERVIEW OF PHOTOGRAPHIC METHODS IN MONITORING NON-AQUEOUS PHASE LIQUID MIGRATION IN POROUS MEDIUM**Author(s):** Alazaiza, MYD (Alazaiza, Motasem Y. D.); Ngien, SK (Ngien, Su Kong); Bob, MM (Bob, Mustafa M.); Ishak, WMF (Ishak, Wan Mohd Faizal); Kamaruddin, SA (Kamaruddin, Samira A.)**Source:** SPECIAL TOPICS & REVIEWS IN POROUS MEDIA-AN INTERNATIONAL JOURNAL **Volume:** 6 **Issue:** 4 **Pages:** 367-381 **Published:** 2015

Abstract: Over the last decades and among numerous techniques, image analysis techniques occupy a noticeable place in monitoring non-aqueous phase liquid (NAPL) migration in porous media. In recent years, photographic methods have been shown to be valuable and effective tools for measuring NAPL migration and characterization. This study aims to provide an overview of NAPL fate and behavior in subsurface systems. Furthermore, a review of recent literature published on using photographic methods in NAPL migration in one and two dimensions is summarized and presented in this paper. Besides the discussion of the research efforts, recommendations for future research in using photographic methods are provided. This study concluded that, although photographic methods have some limitations and drawbacks, photographic methods are still promising and valuable tools for measuring NAPL migration.

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ISSN: 2151-4798**eISSN:** 2151-562X**Record 6 of 8****Title:** SHEAR STRENGTH DEGRADATION OF SEMARANG BAWEN CLAY SHALE DUE TO WEATHERING PROCESS**Author(s):** Alatas, IM (Alatas, Idrus M.); Kamaruddin, SA (Kamaruddin, Samira A.); Nazir, R (Nazir, Ramli); Irsyam, M (Irsyam, Masyhur); Himawan, A (Himawan, Agus)**Source:** JURNAL TEKNOLOGI **Volume:** 77 **Issue:** 11 **Pages:** 109-118 **Published:** 2015

Abstract: The effect of weathering processes in decreasing the shear strength of clay shale had been done in this study. The drying process of clay shale with sunlight in the laboratory up to 80 days had been conducted to create the conditions of weathered sample. The peak and residual shear strength parameters of unsaturated and saturated clay shale were obtained from triaxial laboratory test, and all samples were tested on each 8 days of weathering process. Decrease of shear strength in peak and residual condition was obtained during 80 days of the drying process. The residual shear strength parameters were distinguished between residual shear strength without stress release and with stress release of confining pressure. The results up to 80 days of unsaturated clay shale showed that the cohesion at peak stress conditions reduced to 30 % based on initial shear strength before the occurrence weathering, while the internal angle friction reduced to 64 %. Residual cohesion without and with stress release reduced to 4 % and 1 %, respectively while residual internal angle friction without and with stress release reduced to 15 % and 5 %. Similar situation also occurs for the saturated clay shale samples.

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ISSN: 0127-9696**eISSN:** 2180-3722**Record 7 of 8****Title:** PREDICTION OF ELECTRONIC WASTE DISPOSALS FROM RESIDENTIAL AREAS IN MALAYSIA**Author(s):** Othman, N (Othman, Norazli); Mohammad, R (Mohammad, Roslina); Kamaruddin, SA (Kamaruddin, Samira Albati)**Source:** JURNAL TEKNOLOGI **Volume:** 74 **Issue:** 10 **Pages:** 1-6 **Published:** 2015

Abstract: The most fundamental element in planning electronic waste management is to acquire reliable data on the total volume of electronic waste generated from various sources such as residential premises, commercial buildings and industrial areas. Hence, a crucial aspect of electronic waste management is to predict the accumulation of electronic wastes in the future. This study aims to predict electronic waste to be disposed of for the next 15 years, focusing only on electronic waste from residential areas. A few rural and urban areas of residential premises were randomly selected as a case study. The result for this study was deduced from the survey and interviews conducted in the vicinity of the study area. Thirty sets of questionnaire were distributed randomly at each selected area. The residential area was divided into three categories i.e. residents with low income (LI), residents with medium income (MI) and residents with high income (HI). The survey was done by distributing the questionnaire to investigate electronic equipment usage and its lifespan by

users as well as the waste management option preferred by the residents. The findings of the study showed that approximately 51% of the generated electronic waste will go through four stages of waste management options i.e. reuse, repair, remanufacturing and recycling, while approximately 49% of the generated electronic waste will go through the disposal option i.e. landfill sites. The result of the study showed that the predicted lifespan for the electronic equipment used by residents in Malaysia is between the ranges of 0-15 years. On average, as much as 5% of used home electronic equipment will be disposed of after 6 years of usage, 41% after 9 years and 3% after 12 years. From the study, the information regarding the percentage of electronic waste that will be reused, repaired, remanufactured, recycled and disposed of for the next 15 years can be gained and is presented via scientific analysis.

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Record 8 of 8

Title: Application Of Digital Image Processing Technique In Monitoring LNAPL Migration In Double Porosity Soil Column

Author(s): Sa'ari, R (Sa'ari, R.); Rahman, NA (Rahman, N. A.); Latif, HNA (Latif, Abdul H. N.); Yusof, ZM (Yusof, Z. M.); Ngien, SK (Ngien, S. K.); Kamaruddin, SA (Kamaruddin, S. A.); Mustaffar, M (Mustaffar, M.); Hezmi, MA (Hezmi, M. A.)

Source: JURNAL TEKNOLOGI **Volume:** 72 **Issue:** 3 **Special Issue:** SI **Published:** 2015

Abstract: This paper investigates the phenomenon of light non-aqueous phase liquid (LNAPL) migration in double porosity soil. Investigation on the migration of LNAPL in double porosity soil was performed on aggregated kaolin using the digital image analysis. The photographic technique was used to capture the migration of LNAPL in aggregated soil samples. The captured digital images were fed through an image processing code to convert them to the hue-saturation-intensity (HSI) format which were subsequently used to plot the 2D LNAPL migration behaviour. The results of Experiment 1 and 2 show that the LNAPL moved downward faster when the moisture content increased. Another observation was that the kaolin granules started to disintegrate at a water content of 35%. In conclusion, using image analysis technique has enabled the researchers to monitor and visualize the LNAPL migration in the double porosity soil columns based on HSI values. The contour plots of HSI intensity value has provide detailed and useful information for future research.

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