

Article

# Anti-gnawing, Thermo-mechanical and Rheological Properties of Polyvinyl Chloride: Effect of Capsicum Oleoresin and Denatonium Benzoate

Laongdaw Techawinyutham <sup>1,2</sup>, Arnuparb Prasarnsri <sup>2,3</sup>, Suchart Siengchin <sup>2,3</sup>, Rapeephun Dangtungee <sup>4</sup>, Sanjay Mavinkere Rangappa <sup>2,3,\*</sup>

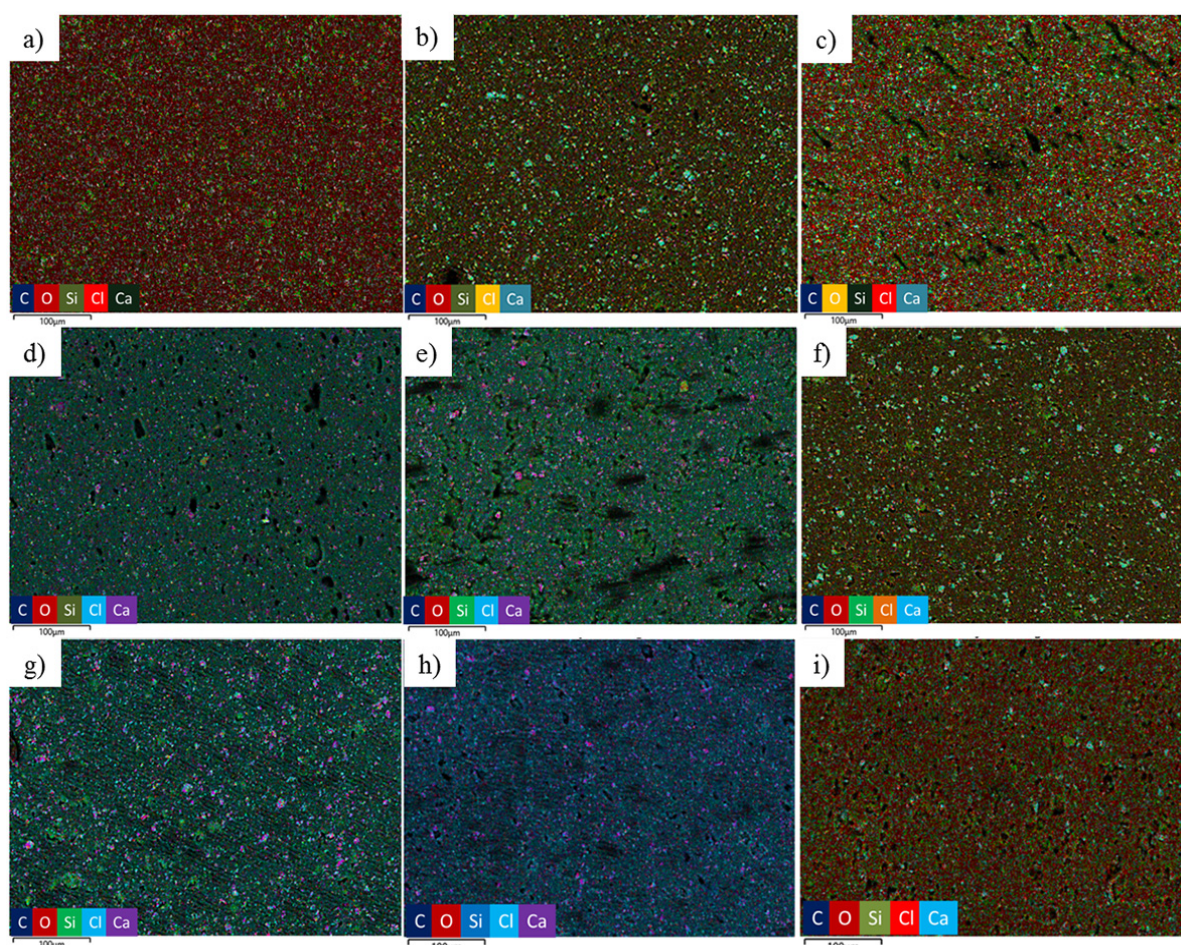
<sup>1</sup> Department of Production Engineering, Faculty of Engineering, King Mongkut's University of Technology North Bangkok, 1518 Pracharat 1 Road, Bangsue, Bangkok 10800, Thailand ; [Laongdaw.t@eng.kmutnb.ac.th](mailto:Laongdaw.t@eng.kmutnb.ac.th)

<sup>2</sup> Natural Composite Research Group, King Mongkut's University of Technology North Bangkok (KMUTNB), 1518 Pracharat 1 Road, Bangsue, Bangkok 10800, Thailand

<sup>3</sup> Department of Materials and Production Engineering, The Sirindhorn International Thai – German Graduate School of Engineering (TGGS), King Mongkut's University of Technology North Bangkok (KMUTNB), 1518 Pracharat 1 Road, Bangsue, Bangkok 10800, Thailand

<sup>4</sup> Maejo University International Collage (MJU-IC), Maejo University, 63 Moo 4 Nongharn Sub district, Sansai District, Chiang Mai, Chiang Mai Province, Thailand

\* Correspondence: [mccemrs@gmail.com](mailto:mccemrs@gmail.com); [mavinkere.r.s@op.kmutnb.ac.th](mailto:mavinkere.r.s@op.kmutnb.ac.th)



**Figure S1.** EDS mapping micrographs of; (a) PVC; (b) I.1; (c) I.2; (d) I.3; (e) I.4; (f) II.1; (g) II.2; (h) II.3; (i) II.4.

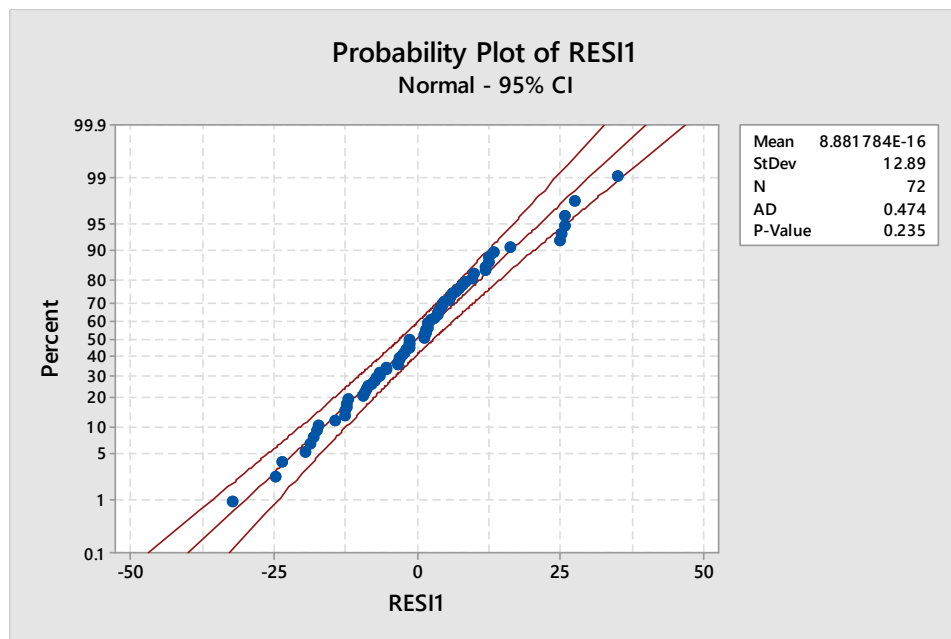


Figure S2. Probability plot of percentage of weight loss.

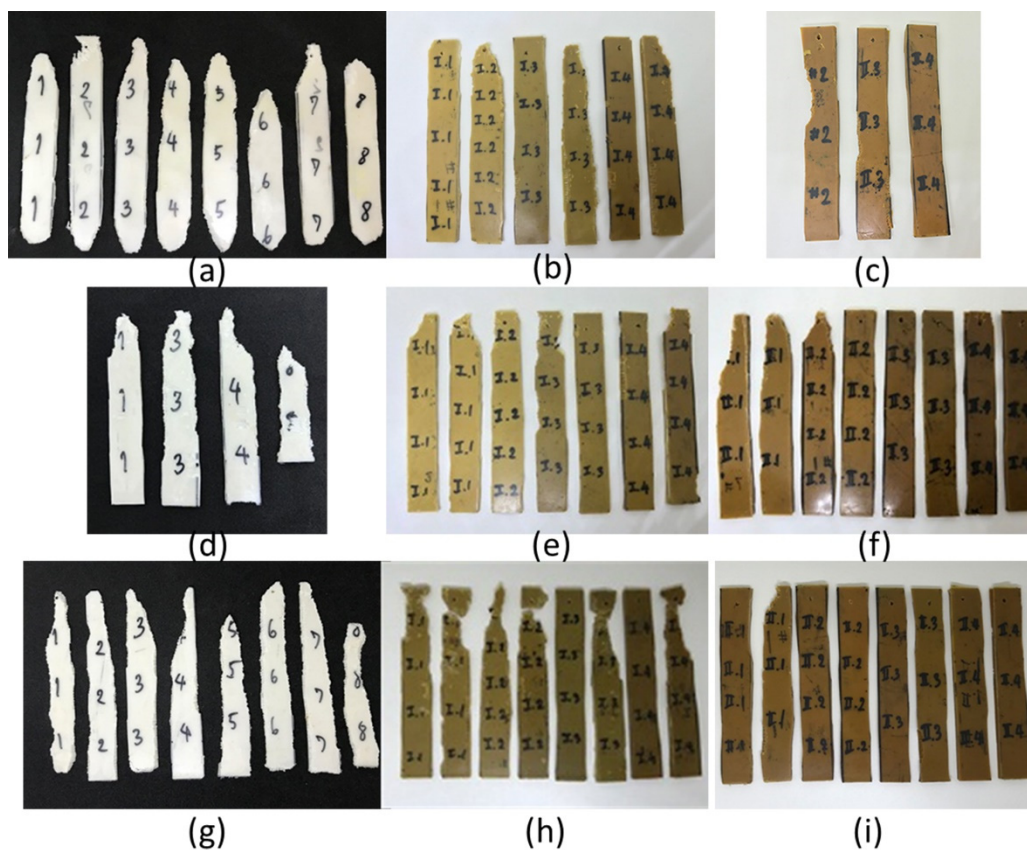


Figure S3. Samples after anti-gnawing test for one month of; (a) Blank in cage 1 in the 1<sup>st</sup> month of testing; (b) Set I in cage 2 the 1<sup>st</sup> month of testing; (c) Set II in cage 3 the 1<sup>st</sup> month of testing; (d) Blank in cage 3 in the 2<sup>nd</sup> month of testing; (e) Set I in cage 1 in the 2<sup>nd</sup> month of testing; (f) Set II in cage 2 in the 2<sup>nd</sup> month of testing; (g) Blank in cage 2 in the 3<sup>rd</sup> month of testing; (h) Set I in cage 3 the 3<sup>rd</sup> month of testing; (i) Set II in cage 1 the 3<sup>rd</sup> month of testing.



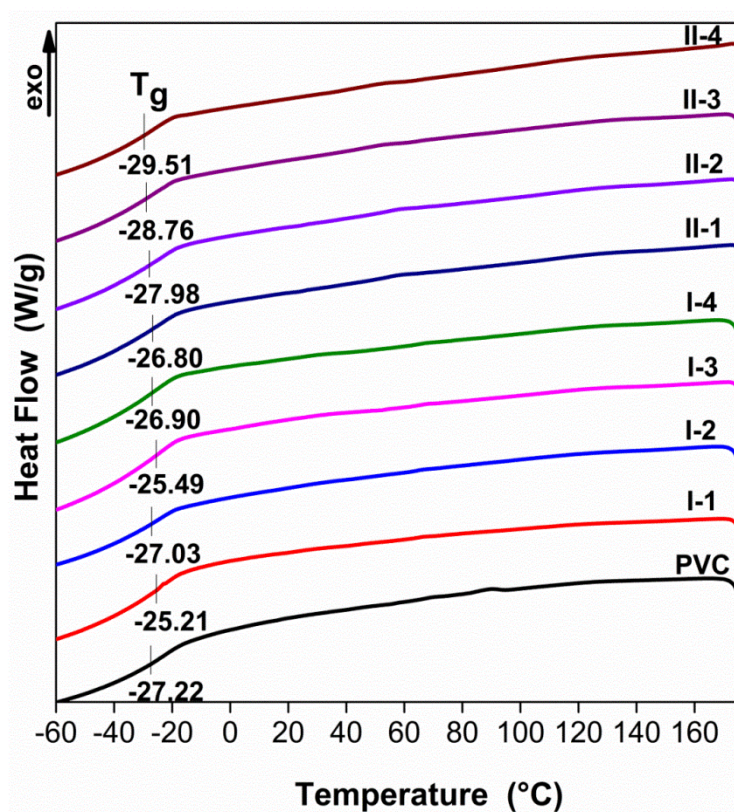


Figure S4. DSC cooling curve of PVC compound and PVC composites.